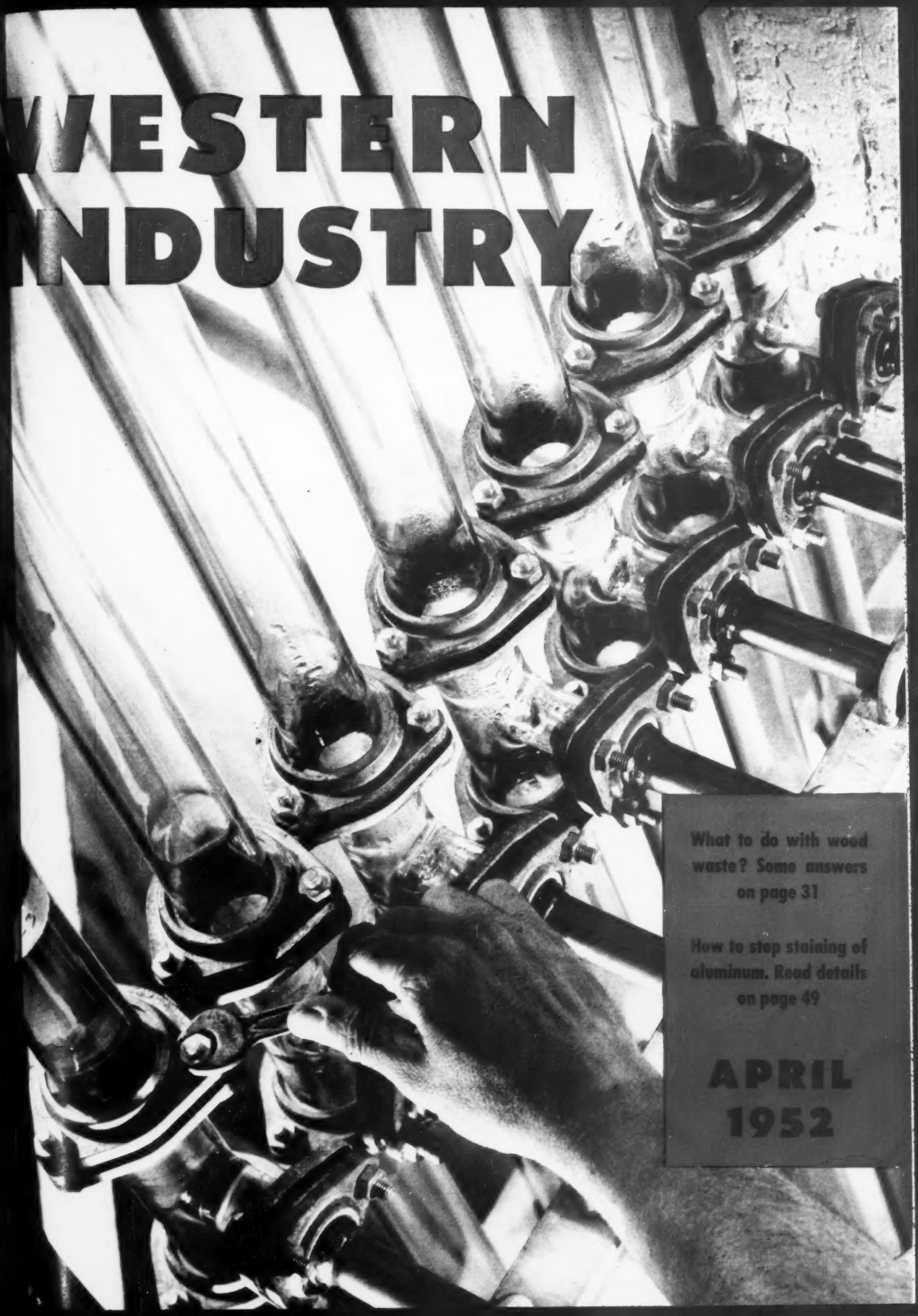
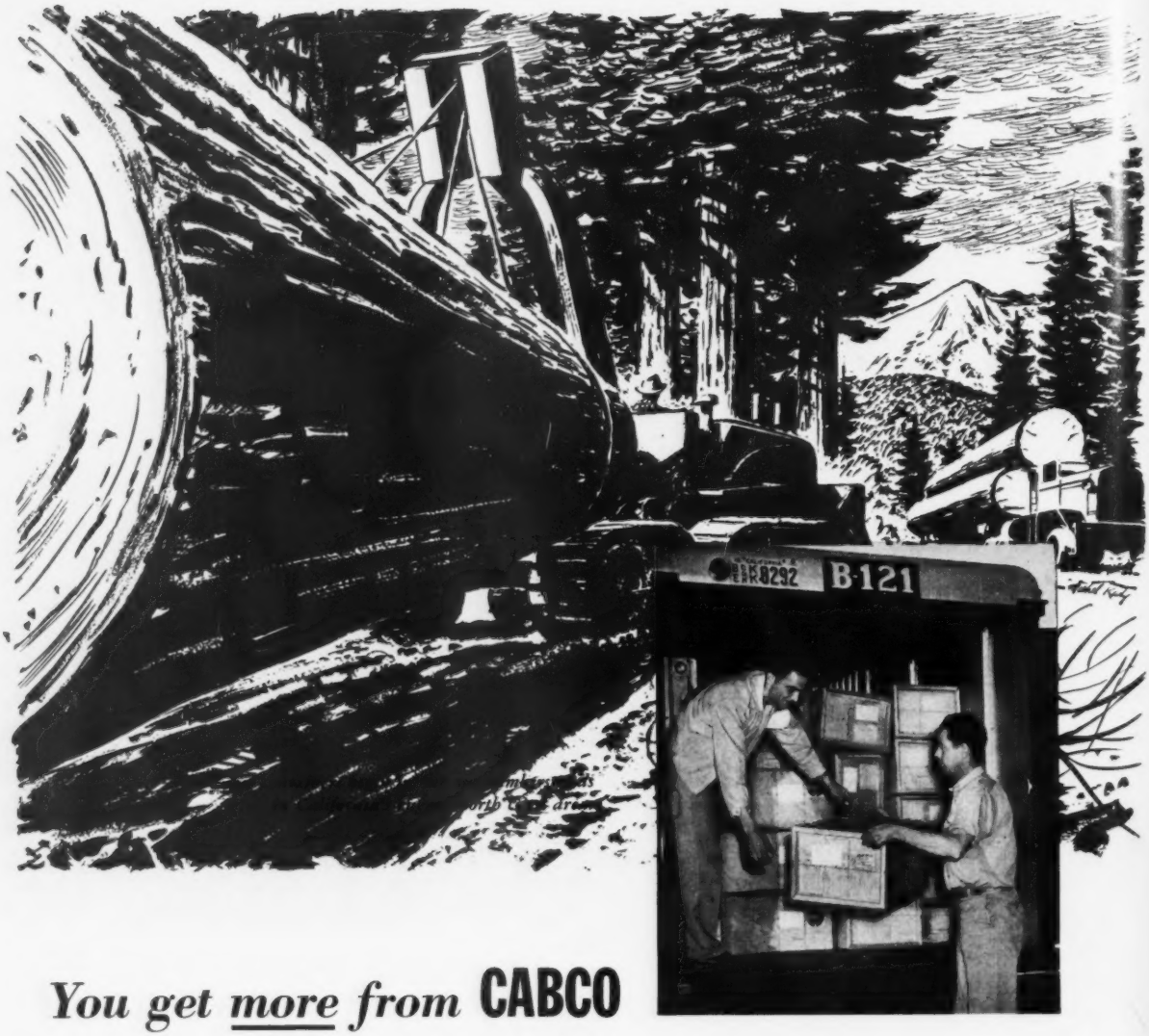
WESTERN INDUSTRY



What to do with wood waste? Some answers on page 31

How to stop staining of aluminum. Read details on page 49

APRIL 1952



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WESTERN INDUSTRY

VOLUME XVII APRIL • 1952 NUMBER 4

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NEXT MONTH—

The final installment of the article entitled "Six Questions About Western Industrial Trends," by Stuart Parry Walsh, originally scheduled for the April issue, is being held over until May so that it may include a review of regional and local promotional activities as discussed at the annual meeting of the American Industrial Development Council at Washington, D. C., which Mr. Walsh will attend this month.

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FRONT COVER

Though glass is an ancient product, some of its Western industrial uses are as new as this month's magazine. Cover shows use of glass pipe at California Packing Co.'s Oakland plant, as part of a syrup manufacturing process. Other uses of glass pipe, discussed on pp. 35-37, run the gamut of industrial applications.

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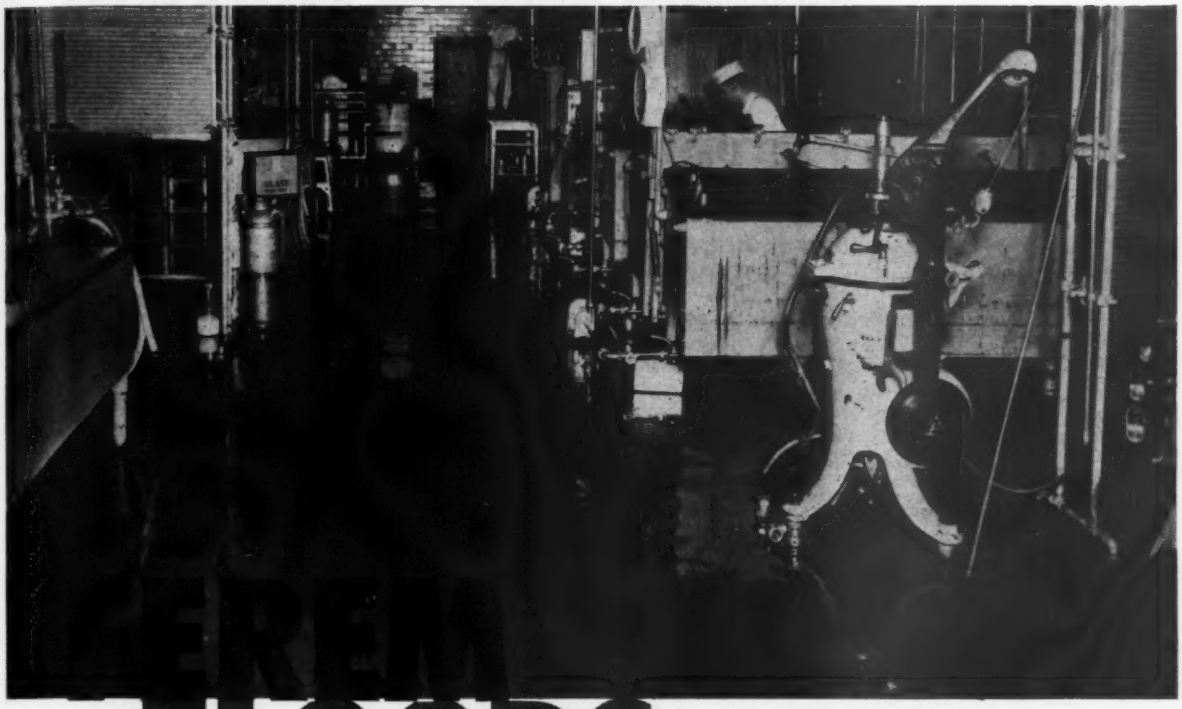

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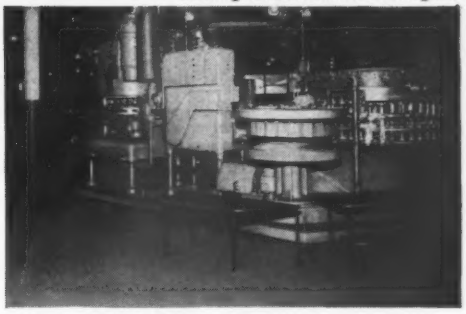

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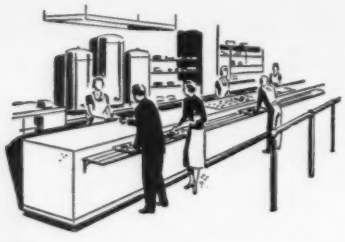

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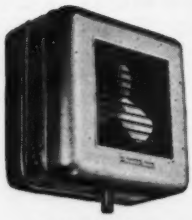

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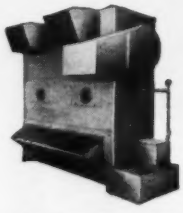
Ventura Fans



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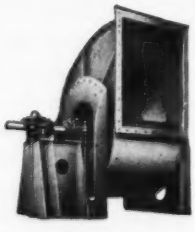
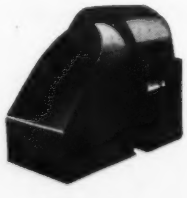


Industrial Fans



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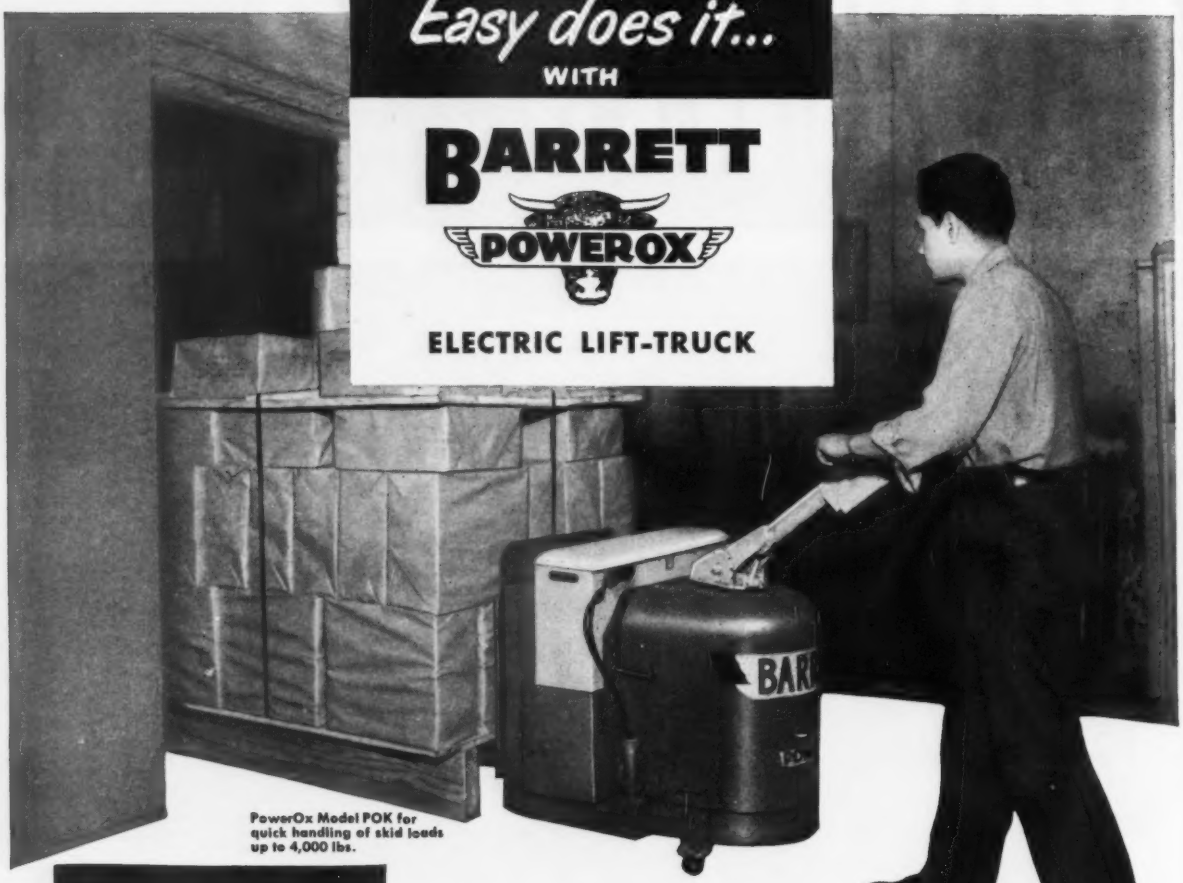

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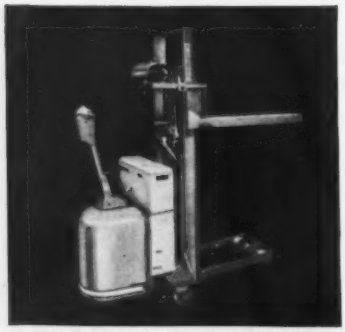
Model PO-POK Platform Truck. Walkie type for handling skids. Short turning radius. 4,000 and 6,000 lb. capacity.



Model PO-40 Hi-Lift Platform Truck. Speeds moving, lifting and stacking of skid platforms and boxes. 4,000 lb. capacity.

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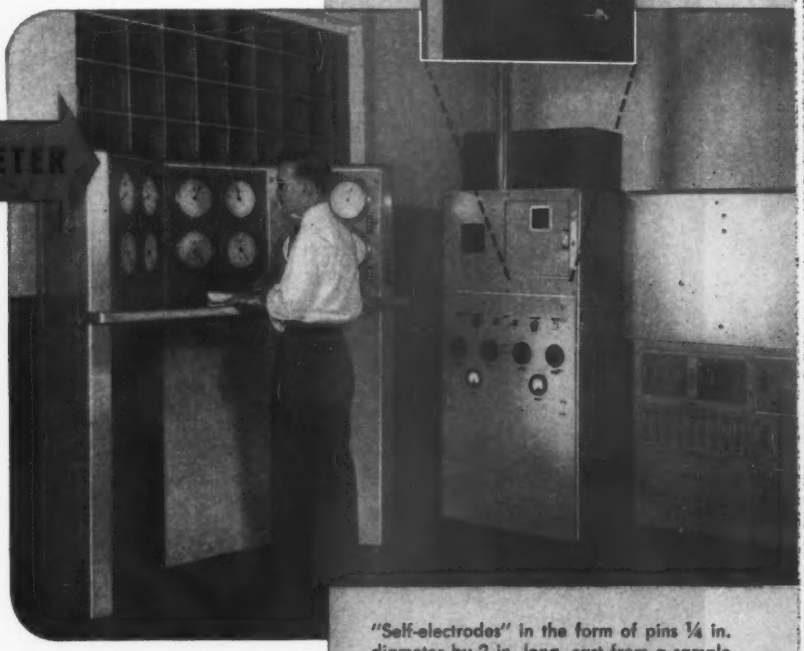

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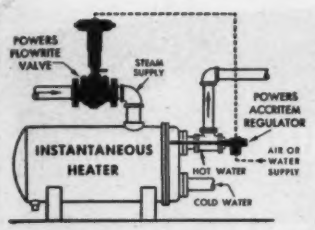

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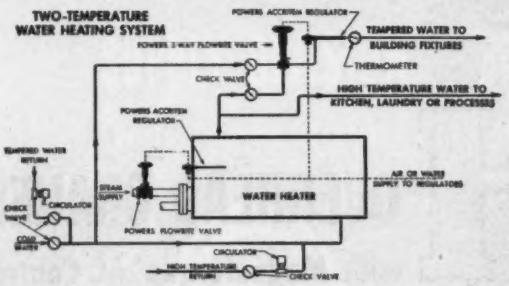

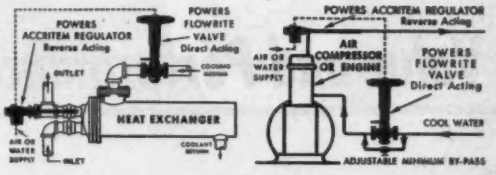

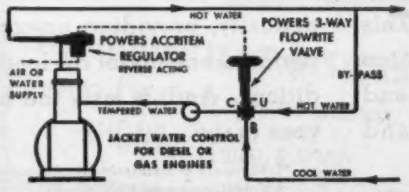

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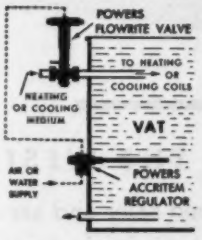

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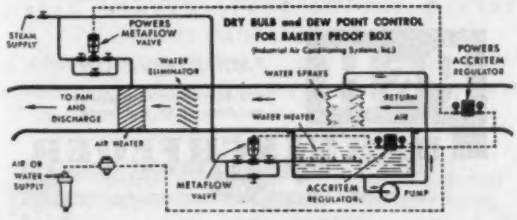
provide an unbeatable combination for *better control* and *lower maintenance*



Write for Bulletin 316—or phone our nearest office for prices and further information about POWERS ACCRITEM regulators and diaphragm valves.

THE POWERS REGULATOR CO.

Established 1891 — See Your Phone Book

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Magnetorque is the AC crane control that can't wear out. This P&H development eliminates the mechanical load brake and its need for adjustment and relining. It operates electro-magnetically, providing unexcelled performance under *all* load conditions. And, it lasts the life of your crane.

*Trade-mark of Harnischfeger Corporation for electro-magnetic type brake.

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Now, P&H Overhead Cranes are built "next door" to the job — in our new Los Angeles plant. This means better service to Western industry. Our new P&H Pacific Division, a large and experienced sales and service organization is backed with complete stocks of genuine P&H repair parts to serve you.

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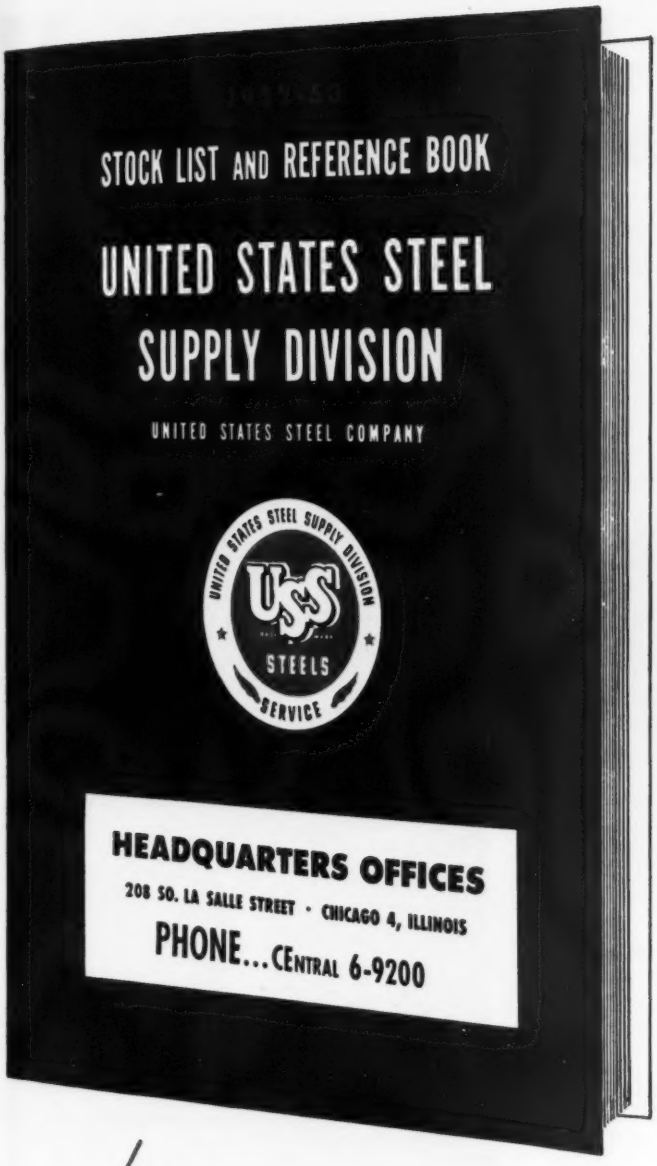
the P&H Line



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- This easy-to-use, illustrated steel guide is packed with useful information and features:
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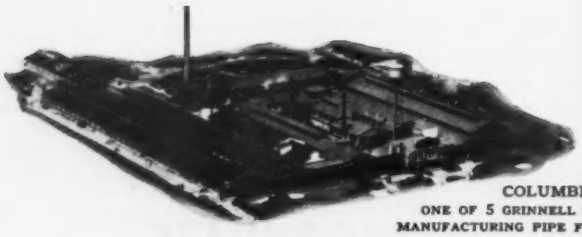

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ONE OF 5 GRINNELL PLANTS
MANUFACTURING PIPE FITTINGS

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complete-line manufacturer of high quality PIPE FITTINGS

offers you...

- Complete line of high quality malleable iron and cast iron pipe fittings.
- Large stocks of pipe fittings — mass-produced by skilled workers using modern equipment.
- Dependability — the result of finest materials, equipment and methods; assured by rigid production control and triple inspection.
- Coast-to-coast network of branch warehouses and distributors — making available local stocks of Grinnell pipe fittings.

WHENEVER YOU ORDER PIPE FITTINGS,
CALL YOUR NEARBY GRINNELL WAREHOUSE OR DISTRIBUTOR

ONE OF 30 GRINNELL BRANCH WAREHOUSES

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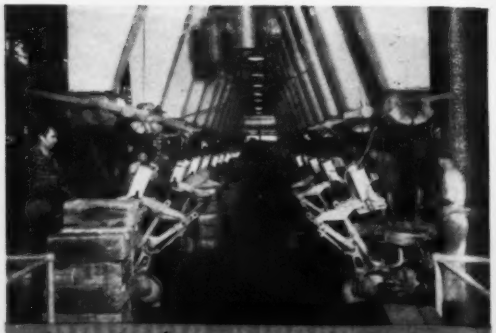
WHENEVER PIPING IS INVOLVED



Dimensional accuracy assured by finest equipment and modern methods of mechanized molding.

Smooth inside finish obtained by the use of the best core sand and the employment of superior core making equipment.

Superior metal, poured into molds on continuous conveyors, gives Grinnell pipe fittings extra strength . . . extra ruggedness.

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Build Faster . . . at Lower Cost with BUTLER Buildings

Twelve Butler Buildings at Military, Kansas, provide storage space for 15,000 tons of sacked ammonium nitrate. Each building is 42 ′ x 260 ′ x 10 ′.

When space is needed in a hurry, choose Butler Steel Buildings—for fast expansion of existing facilities or new building construction.

Butler Buildings offer Western industry these special advantages: (1) lower initial cost (save up to 50 per cent of the cost of conventional construction); (2) easily erected with less labor; (3) ready for use in days instead of weeks; (4) long-life, bolted construction, yet easy to dismantle and move to new locations; (5) fire-safe (low insurance rates); (6) weathertight, wind-resistant; (7) easily adapted to practically any industrial need; (8) low maintenance; (9) wide range of sizes.

Butler Buildings are made at our Richmond, Calif., plant, for convenient delivery to West Coast industry . . . and have been proved in use for more than 40 years. For information on how Butler Buildings can meet your needs—at a savings to you—see your Butler dealer, or mail coupon below today.

Straight Sidewalls . . . Use All the Space You Pay For

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For prompt reply, address Butler Manufacturing Co., Dept. W124, Richmond, Calif.

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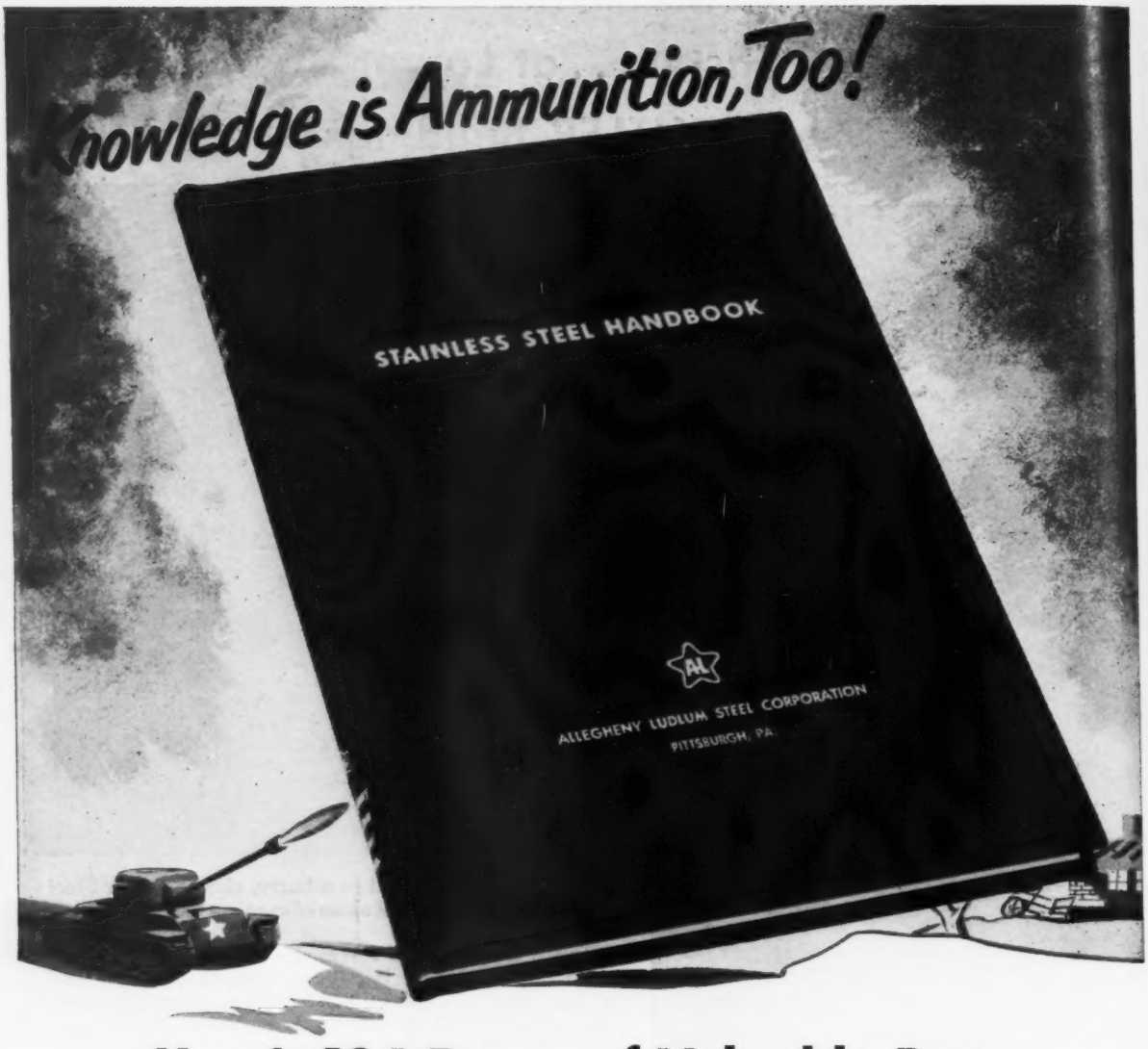

Here's 124 Pages of Valuable Data on STAINLESS STEEL

Stainless steel is a critical rearmament material. As the nation's mobilization program shifts into higher speed, supplies of this vital alloy are becoming increasingly restricted. If you're using stainless, be sure you make every pound go as far as possible.

Allegheny Ludlum's new 124-page, case-bound Stainless Steel Handbook is ready for distribution now. It will help you to select the right stainless steel and to use it right. Comprehensive listings of analysis, properties and characteristics of each type will guide you in specifying grades that will do your job most efficiently. Clear, concise fabrication data will help you speed production and cut waste.

Your copy of the Stainless Steel Handbook will be sent—*without charge*—upon request. Our only stipulation: please make your request upon your company letterhead. ● Write Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pa.

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Remember this also
America must have more Scrap to make more Steel!
Get in the Scrap Now!

You can make it **BETTER** with
Allegheny Metal

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TIME-TESTED STAINLESS STEEL

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT Calol O.H.T. Grease

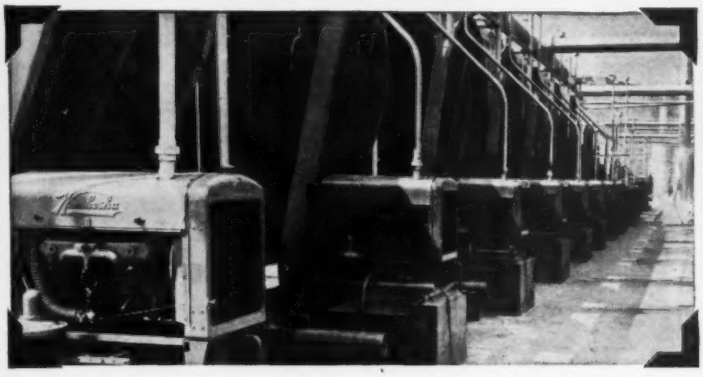
UNIT High-speed ball bearings

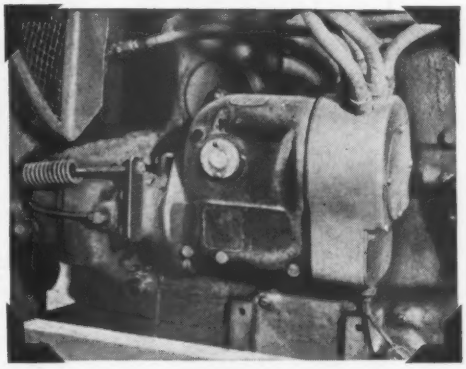
OPERATION Magnetos

CONDITIONS 160 F. ambient temp.— high speed, constant load

FIRM Sunray Oil Corp., Newhall, Calif.

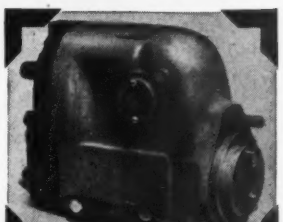
Anti-friction-bearing-maintenance work cut in half!



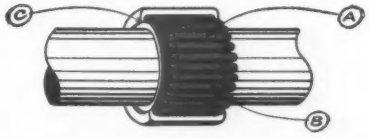


144 HIGH-SPEED BEARINGS in 72 magnetos on various types of engines required servicing at 1- to 3-month intervals until Calol O.H.T. Grease was used on them. Now they are serviced only at intervals of 3 to 6 months, although heat from the continuously operating engines keeps "drive-end" bearings at an average temperature of 160°F. Three other brands of comparable type grease tried by Sunray Oil Corp., owners of the engines, would not stay put on the magneto bearings under these tough conditions. Calol O.H.T. Grease has lubricated bearings satisfactorily in temperatures up to 400°F.

IN SERVICE TWO YEARS in the "hot end" of the magneto at right, this bearing is still in good condition. It was lubricated twice yearly with Calol O.H.T. Grease. This special grease for bearings is recommended for all types including sealed bearings in electric motors and generators. Use it anyplace where extended service is required or oxidation and high temperatures may be a problem.



How Calol O.H.T. Grease protects bearings in severest operating conditions



Used in any type of bearing under any operating condition, high temperature-low speed, high speeds to 10,000 rpm, temperatures from minus 10° F. to 400° F., CALOL O.H.T. Grease will last indefinitely.

A. Contains special oxidation inhibitor—helps prevent rusting, corrosion, hardening of grease at any time.

B. Resists high temperatures—eliminates coking and formation of deposits.

C. Provides excellent seal against water... lubricates efficiently in slight moisture.

FREE CATALOG: "How to Save Money on Equipment Operation," a new booklet full of valuable information, is ready for you. Write or ask for your free copy today.

TRADEMARK "CALOL" REG. U.S. PAT. OFF.

CALOL

STANDARD TECHNICAL SERVICE checked this product performance. For expert help on lubrication or fuel problems, call your Standard Fuel and Lubricant Engineer or Representative; or write Standard Oil Company of California, 225 Bush St., San Francisco.

STANDARD OIL COMPANY OF CALIFORNIA

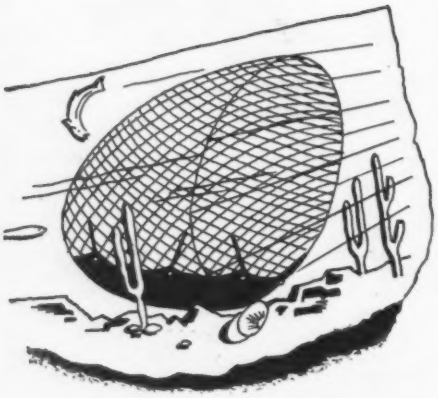
CASE OF THE BROKEN SHRIMP NETS...

The little shrimp were feeling gay, the fishermen perplexed
It seems the mean old ocean floor was too tough for the nets.
The nets, you see, were made of hemp. They couldn't stand the shock
Of being dragged oe'r jagged shells, coral, sand and rock.

And, despite the most laborious work to keep the nets in shape,
The damage kept recurring and the shrimp — well, they escaped.
The problem grew as loss increased, but nothing seemed to stop it.
The nets were lost, the shrimp were lost and likewise so was profit.

But fishermen are knowing folk and, strange as it may be,
They called Republic Rubber in for combat with the sea.
Republic took one look around (and, just as you'd expect!)
They came up with the answer that saved the fishing nets.

A rubber shield of Chute Lining, fastened 'neath the hemp,
Absorbed the bruises, cuts and shock yet showed no punishment.
It's the fishermen who now are gay, the shrimp the one's perplexed
And another problem has been solved by Republic's Specialists!



Republic Chute Lining, an industrial rubber product that can absorb more punishment than almost any other material, including metal, is called "chafin gear" by East Coast shrimp fishermen. The lining, fastened to the nets' lower surfaces, prevents damage caused from contact with the ocean bottom.

REPUBLIC RUBBER SPECIALISTS can help *you solve your* industrial problems, too! Write today for full facts.

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You can make better products from clean, smooth, flat Chase Sheet Brass and Copper. Chase sheets are free from oxide coatings, excess grease and oil. That means they are uniform in color and have a bright finish.

CMP orders. We can make favorable mill deliveries on authorized Controlled Materials orders. In many cases our warehouses can ship from stock. Your inquiries are invited.

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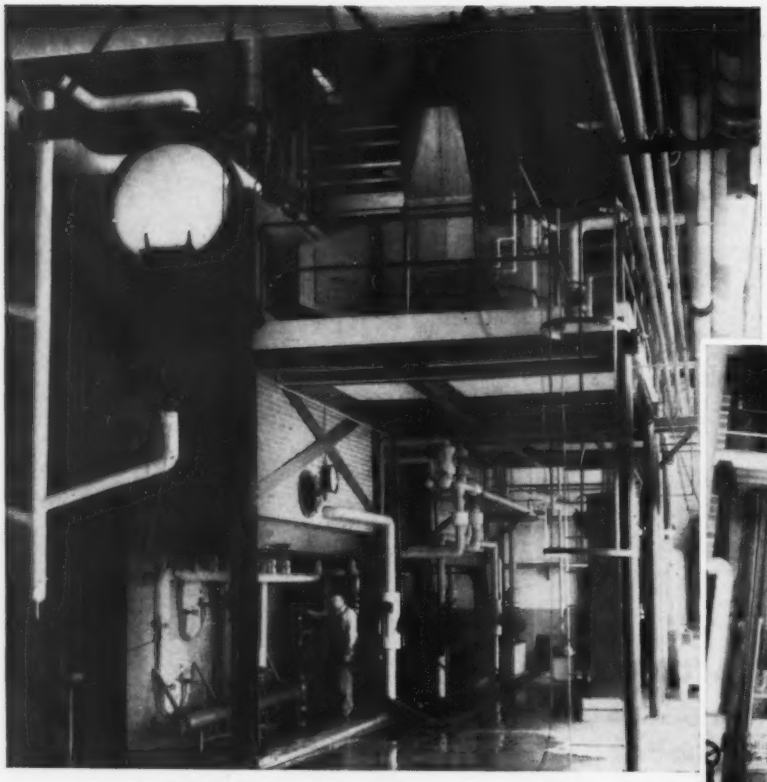
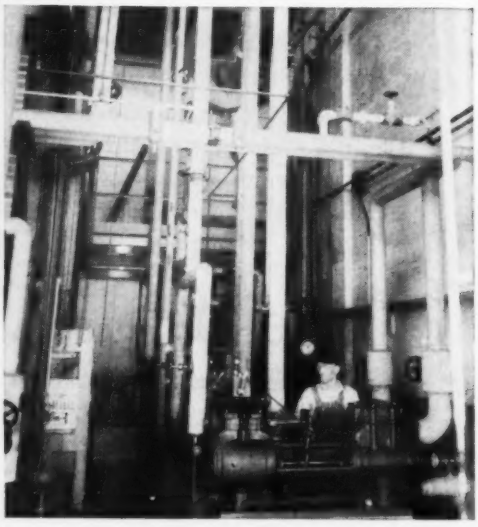


INSTALLATION:
CALIFORNIA PACKING CORP.
Plant No. 3—San Jose, Calif.

LEFT: Boiler room view of Fiberglas PF (Preformed) Pipe Insulation, finished with fire and water treated canvas, on all boiler feed-water lines for 500,000 lbs/hr. steam boilers.

BELOW: Fiberglas PF Pipe Insulation on boiler feed-water lines and Fiberglas PF (Sheet) Insulation on deaerating tank maintained at 220° F. temperature.



FIBERGLAS* Pipe Insulations...

Reduce Costs for Food Processing Industry

In a wide range of applications throughout industry, including food processing, Fiberglas PF (Preformed) Pipe Insulations are keeping fuel and maintenance costs down. Consider their *unique* combination of fine performance qualities:

- **High insulating value**
- **Won't rot or decay**
- **Incombustible**
- **Easy to apply**
- **Moisture resistant**
- **Non-corrosive**
- **Sanitary—provide no sustenance for bacteria or vermin**

Savings in operation cost result from Fiberglas Pipe Insulation's high thermal efficiency. Thermal conductivity (k) equals 0.24 at 75°F. and permits fine temperature control with a minimum of fuel consumption.

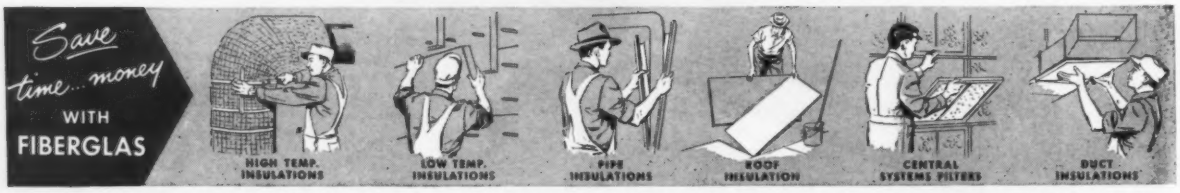
Made of ageless fibers of glass, Fiberglas Pipe Insulation provides long-life protection and low maintenance cost. Durability, combined with its extreme light weight, also makes possible rapid, low-cost installation for outdoor and indoor applications.

In pipe sizes from ½" to 30" and forms suitable for low and high temperatures up to 600°F., Fiberglas PF Pipe Insulations are available through distributors and applicators located in every principal city throughout the ELEVEN WESTERN STATES.

For name of your local Fiberglas applicator or further information, phone the Fiberglas branch office nearest you, OR write to Owens-Corning Fiberglas Corporation, Dept. 113-K, P. O. Box 89, Santa Clara, California.

PACIFIC COAST DIVISION SALES OFFICES: Albuquerque, Denver, El Paso, Eugene, Fresno, Los Angeles, Phoenix, Portland, Sacramento, Salt Lake City, San Diego, San Francisco, San Jose, Seattle.

Pacific Coast Division of OWENS-CORNING FIBERGLAS **SANTA CLARA, CALIFORNIA**



*Fiberglas is the trade-mark (Reg. U. S. Pat. Off.) of the Owens-Corning Fiberglas Corporation for a variety of products made of or with fibers of glass.

Now LEWIS-SHEPARD®

Offers You ELECTRIC FORK TRUCK Operation

at 1/2 the usual cost!

WE TOOK a need and built a truck around it . . . From every indication there was a real *need* for a Rugged, Light-Weight, Electric Fork Truck . . .

- Lower in Price
- Demanding less space than any other
- Calling for slightly less travel and lifting speed

Persistent repeat orders from scores of blue ribbon companies are the very best proof that *the "J" fills the need!*

SPACEMASTER® "J" MODEL from $2765

1000 1500 & 2000 LBS. CAPS. Battery and Charger Included

IF YOU are cramped for space . . . have limited floor load capacity . . . need light duty Electric Fork Truck Operation for

RECEIVING • PRODUCTION • FEEDING
SHIPPING • WAREHOUSING

the "J" will give you all these important time and money saving features . . . *Plus Lewis-Shepard Heavy Fork Truck Quality!*

MULTIPLY MANPOWER · LEWIS-SHEPARD ·

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SALES-SERVICE in PRINCIPAL CITIES
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LEWIS-SHEPARD PRODUCTS, INC.
DEPT. J-36 Watertown 72, Mass.

Please send me complete information about your SPACEMASTER "J" MODEL Electric Fork Truck.

Name _____

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City _____ State _____

SEND FOR COMPLETE INFORMATION

FORK TRUCKS • ELECTRIC PLATFORM AND PALLET TRUCKS
JACKSTACKERS • TOTEMASTERS • HANDY HOISTERS • STACKERS AND PORTABLE CRANES
HYDRAULIC AND MECHANICAL LIFT TRUCKS • FLOOR TRUCKS • STEELERS • SKIDS • STORAGE RACKS

THE MOST COMPLETE LINE IS THE "MASTER" LINE

EDITORIAL COMMENT

Inflation Micrometer

IT SEEMS to us that what is most needed in taking steps to control inflation is a good micrometer, to use whenever we have to decide whether something specific is inflationary or not.

The micrometer would be a device that would tell us the real cost of the various things obtainable from the government which are "good for our locality" (or for "our" business or class group). While we exult when one Congressman or Senator "brings home the bacon," we fail to realize that by the same token his opposite number in another state—or several states—brings home an equivalent amount, and until we are all willing to say "This is too expensive," the plunder caravan will continue on its way.

It would be comparatively easy to design, but of course we would have to be willing to use it. Says Dr. N. H. Engle, director of the Bureau of Business Research at the University of Washington, in the Bureau's publication *Pacific Northwest Industry*, "Each of us is willing to control the other fellow, but we want no controls on us . . . Let's awake to what we are doing with our tax money and rise up in rebellion against needless and wasteful expenditures for any special group."

Unfortunately—or perhaps fortunately—the time seems to be approaching, if not already at hand, when it is obvious that the money we get from the government is merely part of what we are already contributing, or about to contribute, in taxes.

So, what organizations in the West will set up committees, engage staff men, or pay some education institution, to make impartial analyses of the real cost of each so-called benefit? Let it be on a basis of (1) what the ultimate cost will be from the resulting chain reaction, (2) how much would be saved by financing the "benefit" by private enterprise, i.e., so that the people who get the benefit pay for it, and those who don't benefit don't pay.

The line for such committees, staff men or educational appointees forms on the right.

Benefits Are Not Wages

EMPLOYEE BENEFITS are considered by Sears Roebuck as a voluntary investment by management in the conviction that it pays an adequate return; wage and salary policies are determined without reference to the scale of benefit payments, which are not considered part of employee earnings. This was pointed out about a year ago by James C. Worthy of the Sears personnel department to the Pacific Northwest Personnel Management Association.

Food for thought. He ventured to suggest that fringe benefits might never have become subjects for bargaining and negotiation had not management itself, in a mistaken effort to improve its bargaining position, lumped its benefit payments into its payroll costs.

The Sears position is a good example of the value of thinking things clear through in labor relations just as much as in any other area of business. Temporizing never pays off in the long run, anywhere.

IN OUR MAILBOX

West On Its Way

Editor, *Western Industry:*

We have found *Western Industry* most helpful.

While our salesmen are always out in the field we like to give them new leads whereever possible and have found your magazine most helpful in that respect through your advertisements but particularly so through your column, "The West On Its Way."

By having our salesmen contact the new or expanding concern mentioned in "The West On Its Way" and explaining our service to them while they are still in the planning stage we are able to save them time and expense and assure them of fine service from the moment their new plant opens.

A. HARLOWE
American Paper Towel Company
Los Angeles

(Western Industry *is the only periodical giving eleven-Western-States-coverage on information of this sort. The material in "The West On Its Way" is carefully culled from various sources: A large number of newspapers to which we subscribe, releases, direct tips, etc.)*

* * *

Inexpensive Meat

Editor, *Western Industry:*

I believe your publication is unique. It occupies a well chosen field all by itself, is particularly fortunate in its name, and does an excellent job. We read your journal from cover to cover, and pass it around among our employees. They too enjoy it, and get a lot of meat out of it.

E. D. SCHIVELY, Manager
Seattle District Office
Worthington Pump and
Machinery Corporation.

(If Western Industry *is a good magazine, it is only because the staff puts in a lot of hard work on it.)*

* * *

Helpful Service

Editor, *Western Industry:*

The information in the articles in your January Review and Forecast Number will be helpful to me and my associates, and I wish to compliment you on the job you have done.

ALDEN G. ROACH, President
Columbia-Geneva Steel Division
United States Steel Company

(The Review and Forecast Number strives to present a comprehensive and detailed picture of the industrial West. Evidently some of our readers feel we are successful at it.)

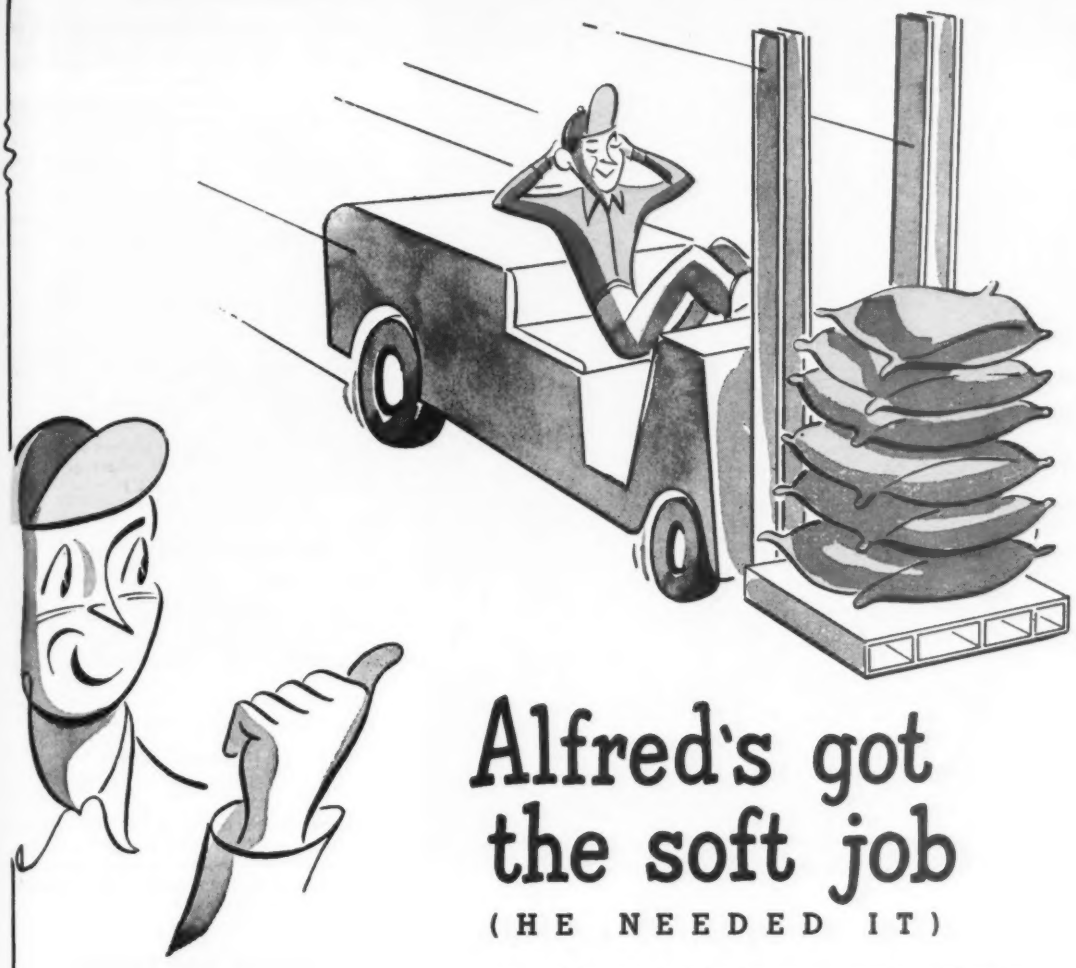
* * *

Sound Thought on a Sound Cause

Editor, *Western Industry:*

Thank you for remembering me with a copy of your 1952 Annual Review and Forecast Number. I found the issue both compre-

Continued on page 26



Alfred's got the soft job

(HE NEEDED IT)

That old lift truck Alfred used to command finally broke down. The company junked it and Alfred didn't fret. Now he's got a new one equipped with MONARCH MONO-CUSHION TIRES—just like the rest of us. Alfred's happy, the company's happy—Alfred gets a soft ride, the company's saving money on floor and truck maintenance.

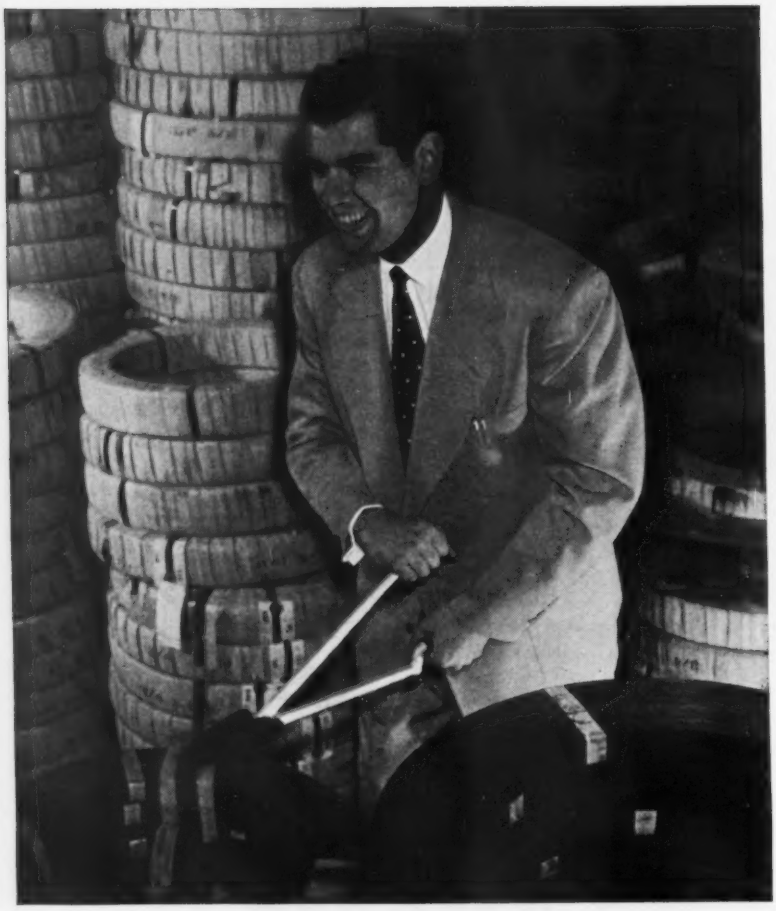
Your best source for replacement tires is the manufacturer of your vehicles, who can supply you, through his distributors, with Monarch Tires engineered for your application.

THE MONARCH RUBBER COMPANY

250 LINCOLN PARK • HARTVILLE, OHIO

DETROIT OFFICE, 7-255 GENERAL MOTORS BUILDING

SPECIALISTS IN INDUSTRIAL SOLID TIRES AND MOLDED MECHANICAL RUBBER GOODS



Get fast steel strapping service from Brainard!

BILL HOGANSON of San Francisco, like other Brainard Strapping System representatives, knows a good thing when he sees it!

Here, in Brainard's West Coast warehouse, Bill surveys a complete stock of various types and sizes of steel strapping, strapping seals, tools, and accessories. On most items delivery is immediate.

That makes Bill happy, since Brainard representatives sell *with service.* They are warehouse conscious. They give personal attention to your packaging and shipping problems, and see that the right equipment is applied to your operations.

To improve your materials handling, call on Brainard. West Coast Offices at 717 Market Street, San Francisco. Phone: Yukon 2-4667.

COMPLETE STEEL STRAPPING SERVICE, LIGHT AND HEAVY DUTY STRAPPING, TOOLS AND ACCESSORIES

For new catalog on Brainard Strapping System, write Brainard Steel Division, Dept. Q-4, 717 Market St., San Francisco

Brainard
SHARONSTEEL
STEEL DIVISION
SHARON STEEL CORPORATION

WARREN, OHIO

IN OUR MAILBOX

. . . Continued from page 24

hensive in scope and astute in its summation of the Western industrial scene.

As a native Westerner I have always taken pride in the economic growth of our region and so I was frankly pleased with your appraisal of the West as "the nation's soundest industrial area."

This soundness, in which I also believe, is to the credit of publications such as yours which have championed the cause of the industrial West so capably.

T. S. PETERSEN, President
Standard Oil Company of California

(Mr. Petersen reminded Westerners nearly three years ago that the number of Western business firms selling out to Easterners indicated that our people in the West were not as well sold on the West's future as many Eastern people. Standard's actions are ample proof that it has no doubt whatever about the West's continued growth.)

* * *

Corrosion Well Covered

Editor, *Western Industry:*

The article which you printed (Atom Bomb Material Tests, Dec. 1951) certainly covers the corrosion test at Hanford very well. We have no suggestions for a more complete coverage or for any different information than Hanford released directly to you.

LESLIE S. FLETCHER
Technical Director
Sam Tour & Co., Inc.
New York.

(This article was one of several published in Western Industry *in the last year for the benefit of subcontractors needing more information about the requirements of primes in the defense program.)*

* * *

Pleased with Plastics

Editor, *Western Industry:*

As usual, your magazine is on the ball and serves your area well. We have read your plastics article with interest and should we be able to give you any statistics or background material the next time you are preparing an article on plastics, we will be very glad to make available to you any information which we have on hand.

LANGDON P. WILLIAMS
Director of Public Relations
The Society of the Plastics Industry, New York

(Another favorable comment on the Review and Forecast Number)

* * *

A Down-to-Earth Comment

Editor, *Western Industry:*

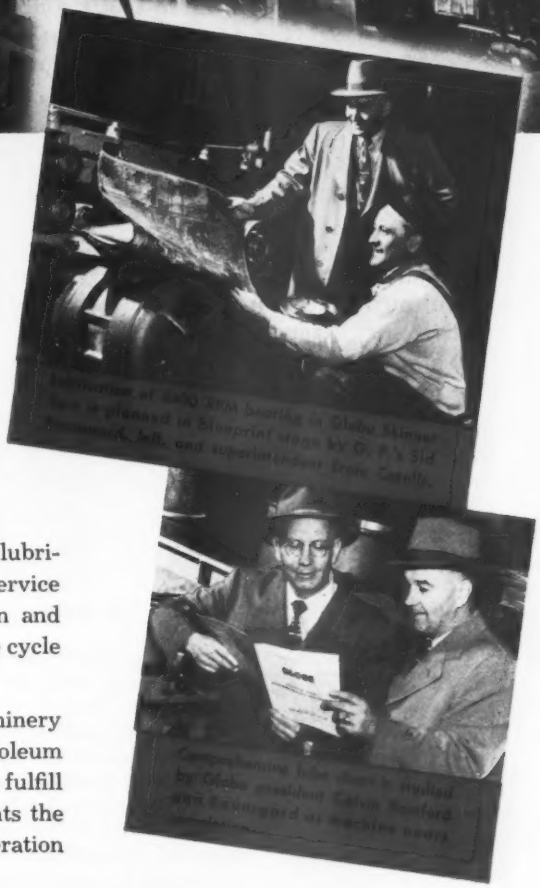
I have just read your item by Pete Schlesinger on the helicopter business. I liked it very much and principally because it was down-to-earth and told the story effectively without any wild and exaggerated statements and tempo.

Sincerely yours,

C. M. BELINN, President
Los Angeles Airways, Inc.

(Both Mr. Schlessinger and Mr. Belinn are Western pioneers in the helicopter business. They are in an industry that's on the way up.)

Preventive Maintenance Starts Early at Globe



Long before it's even built, a veneer or woodworking machine turned out by the Globe Manufacturing Co., Inc., of Tacoma, Wash., is the object of intensive preventive maintenance studies.

Conferring with Globe officials, General Petroleum's Lubrication Engineers go over blueprints and plan the machine's preventive maintenance program. These recommendations are checked regularly while the equipment is being built and later floor-tested.

Upon delivery of the machine to the buyer, G. P. lubrication specialists top off their industrial follow-up service by offering technical assistance in the installation and functioning of the equipment...thus completing the cycle from blueprint to actual operation.

After trying several other companies, Globe Machinery president Calvin Bamford changed to General Petroleum when he found "they were the only oil company to fulfill our service requirements...and Gargoyle lubricants the only products to give us continuous and efficient operation of our woodworking machinery."

11-9

You can put this lube engineering know-how to work at your plant, too. You'll find that G. P.'s modern maintenance methods enable you to lengthen machinery life while reducing lubricant inventories. Call for a survey of your plant today!

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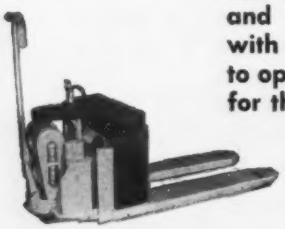
- Saves Man Hours
- Speeds Production

Model PAL Pallet



Break those Production Bottlenecks and reduce handling manpower with Moto-Truc's efficient and simple to operate "Walkies". They soon pay for themselves in savings to you.

Whether its a problem of warehousing, production "Flow" or "Inprocess" inventory; one or more of Moto-Truc's 6 Basic Models is quickly adaptable to your specific needs. Their short turning radius and added power make them the most efficient in the "Walkie" field.

A "twist of the wrist" does it.

Model PAL-5C, Pallet

The above photo shows one of Moto-Truc's Model PALS in a large eastern warehouse. They now do the work of many hands, adding 1/3 more storage space and speed up "in and out" traffic. In Pallets, Platform or Hi-lift types, Moto-Trucs cover the field for efficiency, rugged, all-welded construction and ease of operation.

Write for Bulletin No. 51 Today

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CALENDAR OF MEETINGS

April 30-May 2 — American Public Power Assn. Conference, in Seattle, Wash. Contact Alex Radin, 1757 K St., N.W., Washington, D. C.

May 2-3—Annual meeting of Western Dry Kiln Clubs, at Redding, Calif.

May 5-6—Second National Air Pollution Symposium, at the Huntington Hotel, Pasadena, Calif. Sponsored by Stanford Research Institute in cooperation with California Institute of Technology, University of California, Los Angeles, University of Southern California. Contact A. M. Zarem, Chairman, Rm. 332, 612 South Flower St., Los Angeles, Calif.

May 8-9—U. S. Independent Telephone Association, Executive Conference, in Colorado Springs, Colo. Contact Stewart A. Collins, Secretary, 411-17 Munsey Bldg., Washington 4, D. C.

May 9-10—American Institute of Mining & Metallurgical Engineers conference, at Davenport Hotel, Spokane, Wash. Contact Roger Oscarson, RI 6171.

May 12-15—American Petroleum Institute Division of Refining convention at San Francisco. Contact Lacey Walker, Secretary, 50 West 50th St., New York 20, N. Y.

May 14—Instrument Society of America, instrument show, Community House, Richland, Wash. Contact M. T. Slind, General Electric Co., Richland, Wash.

May 14—Manufacturers Conference, Alameda County Manufacturers Division, Oakland Chamber of Commerce, at Hotel Claremont, Berkeley. Contact Ken Moeller, Oakland Chamber of Commerce, 427 13th St., Oakland, Calif.

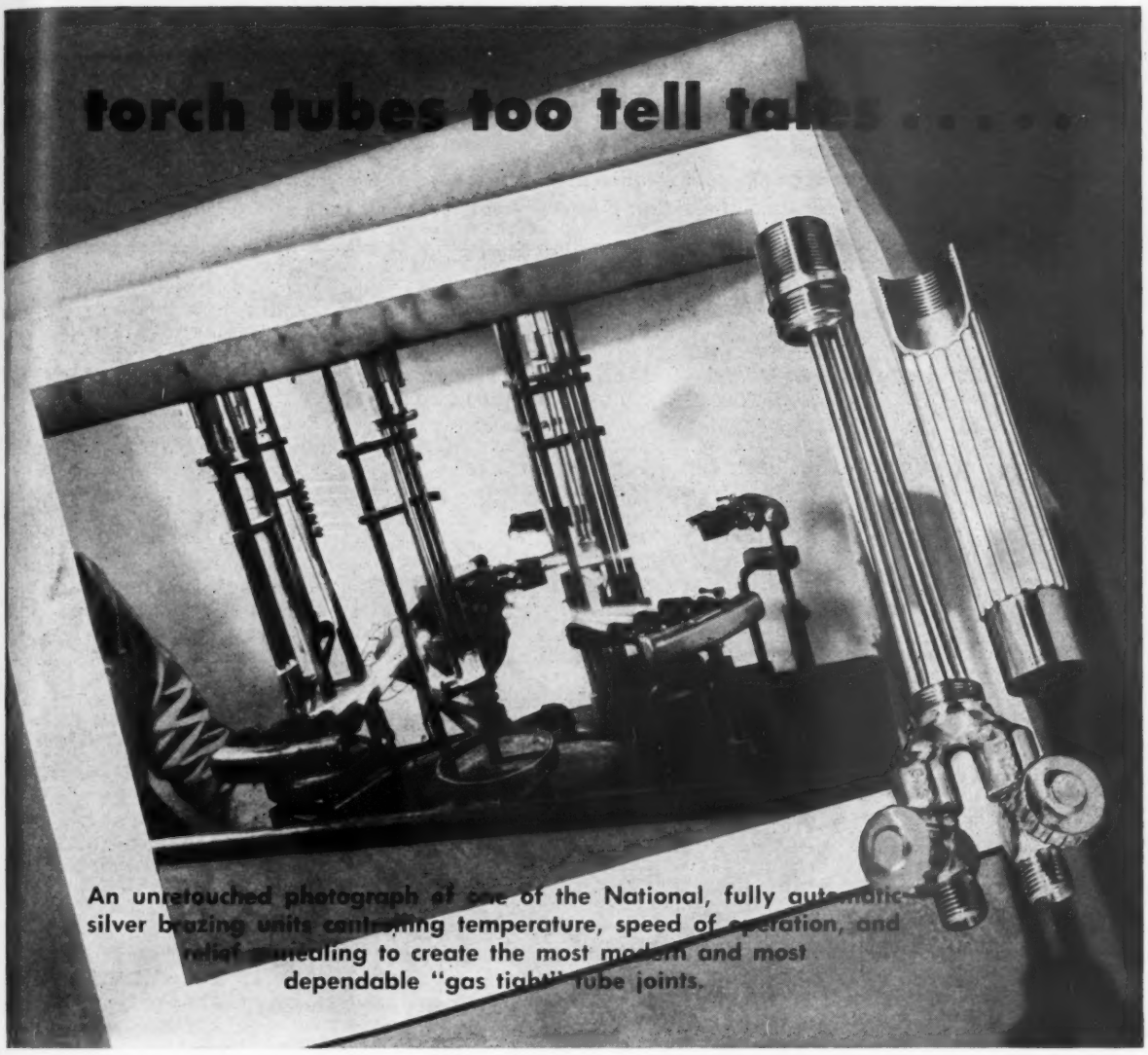
May 15-17—California Society of Professional Engineers Convention, in Los Angeles. Contact A. C. Bullen, 1070 Los Flores Drive, Del Rosa, Calif.

May 18-21—National Office Management Association convention at San Francisco. Contact C. A. Spangler, 132 West Chelton Ave., Philadelphia 44, Pa.

May 18-22—International Conference and Annual Office Machine Equipment Exposition, at Fairmont Hotel, San Francisco. Contact A. C. Spangler, 132 W. Chelten St., Philadelphia 44, Pa.

May 19-20—Northwest Public Power Association conference at Spokane Hotel, Spokane, Wash. Contact Gus Norwood, Executive Secretary, Engineering and Operation Section, Audressey and Macauthier Blvd., Vancouver, Wash.

May 20-23—Office Equipment Manufacturers Institute, at San Francisco. Contact E. D. Taylor, Ad. V. Pres., 1903 N. St., N.W., Washington, D. C.



An unretouched photograph of one of the National, fully automatic silver brazing units controlling temperature, speed of operation, and relief annealing to create the most modern and most dependable "gas tight" tube joints.

Silver brazing, with relief annealing, assures gas tight and wholly dependable joints and — since both fuel gas and oxygen are separately conveyed — in independent tubings — no gas flows within the torch handle — this for your safety.

No gas flows in the torch handle — it's safe.

For safety sake each gas, the oxygen and the fuel gas, is separately conveyed from the torch needle valve body to the torch head — no gas flows in the torch handle.

For safety sake both the oxygen and the fuel gas tube is securely and permanently fastened by the most modern, fully automatic, silver brazing process which controls both temperature and timing.

Made by National SINCE 1910 WELDING EQUIPMENT CO., San Francisco 5, California

510

RYERSON STEELGRAMS

Following are a few paragraphs on the steel situation as we see it here at Ryerson. We hope you will find the information helpful in planning your steel purchasing.

Warehouse steel prices, frozen at 1950 levels throughout 1951, are now determined by new Government formula based on monthly average cost, including transportation charges, plus mark up. In beginning, we adjusted prices monthly to keep within Government Regulation. Now we have established prices on most products sufficiently below OPS ceilings to avoid monthly changes as prices vary.

Steel procurement: Though most steel products are still in short supply, production is catching up with demand on some kinds and sizes. On carbon steel bars, for example, larger sizes are short—but our stocks of smaller sizes are fairly good in both hot rolled and cold finished. And both hot and cold rolled carbon steel sheets are also coming into better supply—especially cold rolled, although 19 gauge and lighter are not in as good supply as the heavier gauges.

Our picture, briefly, on other products: Mechanical tubing—welded in good supply, seamless still tight. Alloy bars—over all stocks improving but still unbalanced as to sizes. Structurals and plates—demand still exceeds supply. And stainless steel—our stocks of nickel-bearing stainless are a little better (but use is still strictly controlled by the Government).

More on stainless—Now you only need money to buy straight chrome stainless—no Government allotments or ratings of any kind are required. And as for money, the straight chrome types cost less than the nickel-bearing stainless steels they replace.

While the use of chrome stainless was originally forced on manufacturers by Government restrictions on nickel, many companies have indicated that they may continue to use it—even when the 18-8 steels are again available. In other words, it took restrictions to reveal the possibilities of 430 and other straight chrome types. Ryerson has large and diversified stocks of these steels.

Another change in alloy steel stocks is taking place in line with a new NPA practice. Steels affected—interim and boron alloys. Warehouses will be limited to .60 nickel and .15 moly in carburizing types and .40 nickel and .15 moly in direct hardening types. These continuing changes emphasize again the importance of knowing exactly how unfamiliar alloys will react—knowledge supplied by the hardenability information sent with every shipment of Ryerson certified alloys.

Under the Government's Mills Plan, corporations must pay 70% of 1951 taxes in the first half of this year, and next year, law requires 80% payment in first half! Until last year, payment of only 50% in the first half was accepted practice. So this represents a considerable shift in the burden of cash requirements and may call for special fiscal planning by many companies. If your steel purchasing picture is affected, we suggest you discuss the matter with one of our experienced credit men.

Fabricators who apply to NPA for ratings to purchase metal working machinery are finding it is not necessary to have contracts directly connected with the defense program. Those with work essential to civilian economy can easily get a rating, too.

Babbitt procurement: Purchase of high tin babbitt still requires an M-8 certification, but Glyco babbitt from Ryerson, which has physicals equal to those of high tin types, is still available to all without a rating of any kind. And Glyco costs only about half as much...Our deliveries on alloy forgings are improving. Wire rope and chain—prompt shipment in a wide range of types and sizes.

As a substitute for cold drawn seamless mechanical tubing, Ryerson tubing specialists are recommending a welded tube identified as bright-finish hot rolled. this tube comes in a wide range of round and square sizes. Costs substantially less than the seamless and has a clean scale-free surface that takes paint very well.

JOSEPH T. RYERSON & SON, INC.

LOS ANGELES PLANT: Box 3817, Los Angeles 54. Plant: 4310 E. Bandini Blvd. Phone: ANgelus 2-6141. From San Diego (No toll) Phone: ZEnith 6660.
SAN FRANCISCO PLANT: Box 188, Emeryville. Plant: 65th & Hollis Sts. Phones: OLympic 3-2933, ENterprise 10176.

WOOD WASTE

What shall we do with it?

Western lumbermen attack a knotty problem and come up with some answers that promise full utilization of wood waste

By MILTON H. MATER
Managing Owner
Mater Machine Works
Corvallis, Ore.

THE WEST TODAY is witnessing the amazing phenomenon of lumbermen, with crisp bills crackling in their wallets, looking for ways to invest in wood waste utilization processes. Interest in wood waste utilization has spurted in recent years, not only among large mill owners, but many medium sized and groups of small mills. Inquiries at forest products laboratories are reaching new highs. Chippers, debarkers and hardboard plants, rarities in the West a few years ago, have increased tremendously since the war.

Full wood waste utilization, not so long ago a dream of "long hairs" in the laboratory, has now captured the imagination of lumber men in the woods.

The reasons for this sudden interest in utilizing every scrap of every tree, including the bark, are many. Among them are: the high cost of logs, the increased competition for available timber stands, laboratory developments in chemical and physical wood utilization processes, and a growing realization that the progress and growth of the West is tied up with the diversity of lumber products manufactured here. Of course, good markets for products help stimulate interest in manufacture.

Full utilization of our forest resources, the lumber industry realizes, means not only converting the cull logs, slabs, edgings and sawdust to useful products. It means improving the processes of manufacturing lumber so that less wood is wasted. Decreasing the amount of wood wasted is the first problem.

Full utilization begins in the woods with better logging methods and utilization of Western hardwoods and other unused species. A step in the right direction is the development of a good portable sawmill which economically cuts small stands of timber.

Then in the sawmill, mechanization of equipment and improved practices are needed to help decrease saw kerf and to keep to a minimum the number of mis-manufactured boards.

A trend in getting more lumber out of each log is seen in the increasing popularity of debarkers. Log barkers

SORTING WOOD from a waste chain. Pieces of wood will be used in manufacture of furniture; wood waste left over is still the problem today.

are new in the West, and have so far, because of the heavy initial investment, been restricted to large mills. Log barkers came into their own when mills started chipping their wood for the pulp and paper mills. It has been found that debarkers not only provide clean logs for chipping, but give about 5% advantage in upgrading of logs. The clean logs enable the sawyer to cut more usable lumber.

There's Gold In Them Logs

Classic estimates of wood waste hold that 1/3 of the tree is wasted in the woods, 1/3 in the saw mill, and only 1/3 appears as merchantable lumber. Improved practices may decrease the amount of wood waste somewhat, but approximately 2/3 of every log is still wasted. Fortunately, the number of ways to convert this waste into useful products is growing.

Public fancy has been captivated by the prospect of using wood waste as an auxiliary supply of electric energy in low stream flow periods. The Bonneville Power Administration is considering the use of the turbine, using wood-produced gas developed by the Oregon Forest Products Laboratory.

Western lumber men have been accustomed to regarding themselves primarily as converters of logs into usable, commercial boards. By-products of this process—sawdust, slabs, edger slashings, trimmings—were nuisances to be discarded.

Current lumber thinking, however, is veering in the direction of, "There's gold in them there logs." Some of the large producers are salvaging edgings and slab to make lath, shade and map rollers, matches, toothpicks, signs, toys and novelties. Small pieces of wood are laminated into beautiful and useful consumer goods. Long-Bell Lumber Co., at Longview, Wash., turns rough lumber into manufactured items of furniture.

More complete utilization of wood in wood products has several advantages: (1) it builds up Western industry potential by increasing jobs and the value of manufactured material, (2) it helps bring a greater return from each of the high priced logs, (3) it turns waste into profit.

Hardboard Is Hungry for Waste

Within the last couple of years hardboard has become the symbol of wood waste utilization progress. East of the Mississippi, the Masonite hardboard process has been hungrily digesting great amounts of Southern pine waste since 1926. But here in the West hardboard manufacture is scarcely three years old.

Ralph Chapman, of Corvallis, Ore., pioneered in making hardboard out of Douglas fir waste when he built the first Western hardboard plant in Corvallis. Now there are 11 hardboard plants in the West most of them still under construction. An interest in hardboard is mounting feverishly. Many mills are making surveys and test samples of their mill wastes to see if they can't climb on the hardboard band wagon.

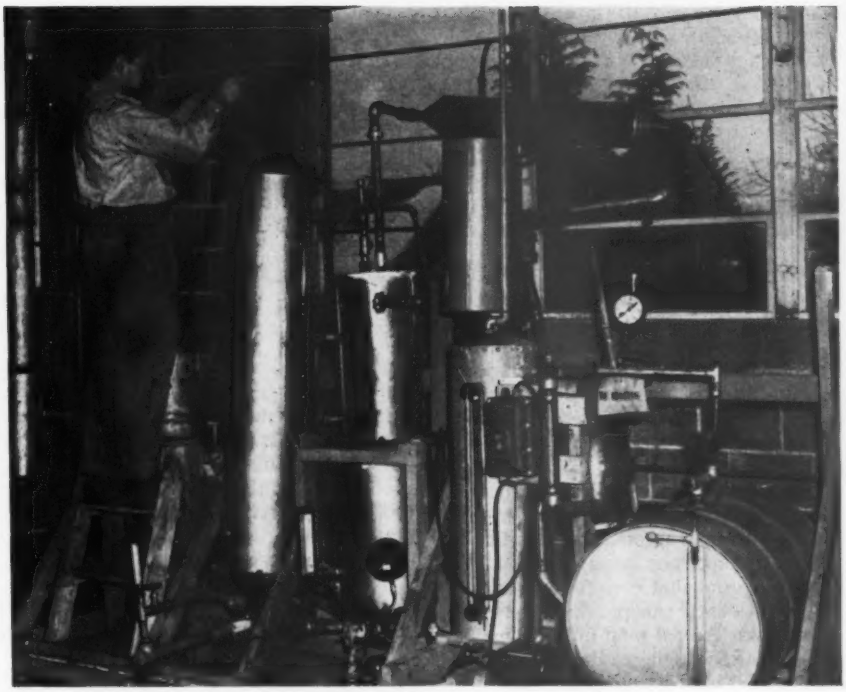
Waste Wood Builds a House

A dramatic example of wood waste utilization is the luxurious home built by Ralph Chapman out of the hardboard he invented. The spacious home is built almost entirely out of Chapco Board. Even the shingles are of Chapco Board. Inside walls, ceilings, flush type wardrobe doors, and other parts are Chapco Board. But a few years ago the waste wood from which this home was constructed would have gone up in smoke!

Lumbermen have recently discovered a bonanza in the form of wood chips. Douglas fir wood chips have become valuable starting materials for the pulp and paper mills. Douglas fir can now be used for many grades of bleached and unbleached Kraft pulp, substituting for bleached hemlock sulfite pulp.

A Bonanza in Wood Chips

This discovery has assumed increased importance in recent years in light of the tightening timber supplies. Since lumber mills produce tons of "waste" wood, it is economically feasible all around to use the Douglas fir for Kraft pulp and reserve the hemlocks for use in sulfite pulp where



POURING GROUND BARK into an extractor, where wax is removed by use of a suitable solvent. This is only one method of waste utilization that can be applied to bark.

Douglas fir wood chips are not considered suitable.

The pulp and paper industry requires its starting material in chip form. Therefore, a new sideline adopted by many mills is the installation of chippers which take the waste and chip it into material for the pulp and paper mills. The past few months has witnessed a tremendous growth in the number of mills chipping waste, but the full potential has hardly begun to be reached.

Chemicals Are There Too

"... We in the lumber industry are still in the stage the petroleum industry was in a few decades back when it went after 'coal oil' (later called kerosene) and threw away the by-products such as gasoline, benzene, oils, greases and all the rest," wrote George E. Owen, of Eugene, Ore., in a letter to *Western Forest Industries Review* last fall. While not everyone in the lumber industry would go all the way with Mr. Owen, the use of wood waste as a source of chemicals is a challenge to the imagination of every mill operator.

Many research groups have been concerned with the chemistry of Western woods. Some of this basic, scientific research is about to reach fulfillment in industrial production.

The wood hydrolysis plant at Springfield, Ore., is well known in the West. The plant has had rough sledding, due to financial and mechanical difficulties, but revived interest in wood waste utilization promises it a brighter future. From wood this plant produces sugar, alcohol, lignin, molasses, wax, and ethyl alcohol.

Wood sugar molasses has broadened the field of wood waste utilization to agricultural applications. Feeding tests have shown that dairy heifers, cattle, swine, sheep and poultry can thrive on wood sugar molasses as well as on cane molasses and other carbohydrate feeds.

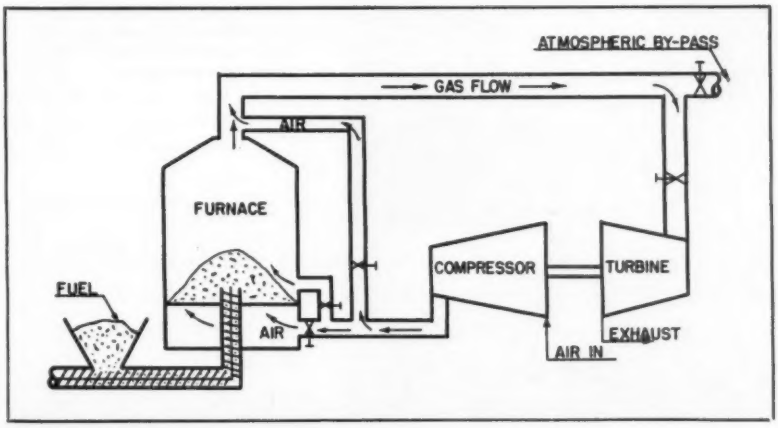
Barking Up the Right Tree

Probably the most interesting results of chemical research in recent years are those which show the wealth of commercially valuable material in the bark of Douglas fir and other Western woods. Professor E. F. Kurth and his students at the Oregon Forest Products Laboratory have discovered valuable new products in bark: Douglas fir wax, tannin, and dihydroquercetin.

Each ton of bark yields $100 worth of wax, $40 worth of tannin and $1,500 worth of dehydroquercetin. Douglas fir wax is hailed as an addition to our economic self-sufficiency. The United States now has to import 80% of its wax from Africa, Argentina, and Mexico.

Four companies have applied for permission to establish pilot plants for extracting wax from Douglas fir.

Schematic representation of a sawdust-fired gas turbine



These companies will utilize the bark from the debarking processes for extracting the wax.

The companies extracting wax will probably also work up to extracting tannin from the bark. The tannin from bark has been tested and found as good as any available. The U. S. imports 70% of the tannin required by our industries.

Are We Too Infatuated?

Some men in the lumber business look askance at what they consider this sudden infatuation with wood waste utilization. They fear that hardboard plants and other plants to utilize wood waste are being erected without sufficient regard to economic, market and competitive factors.

They wonder if in a few years hence there will even be enough forest and saw mill waste to accommodate all the utilization processes being developed. They point out that even today while Douglas County can provide enough sawmill waste for a pulp mill making 200 tons of Kraft pulp a day, in other areas there is hardly enough waste to go around. Mills around Longview, Portland, Tacoma, Everett, Bellingham, Eugene, and other lumber centers have already found that wood waste is no longer a problem. These centers find an almost unlimited market for their pulp chips and hogged fuel.

But these considerations are purely academic at the present time. While the smoke stack is still the mark of the lumber mill and while lumber mills will cover your garden with sawdust mulch for the hauling charges, wood waste utilization is a long way off. And it is the belief of many in the industry that only the traditionally free method of seizing opportunities when they knock can solve the problem of full wood waste utilization.

MILTON MATER, author of "Wood Waste," is managing owner of Mater Machine Works, manufacturer of modern sawmill machinery at Corvallis, Oregon.

Where To From Here?

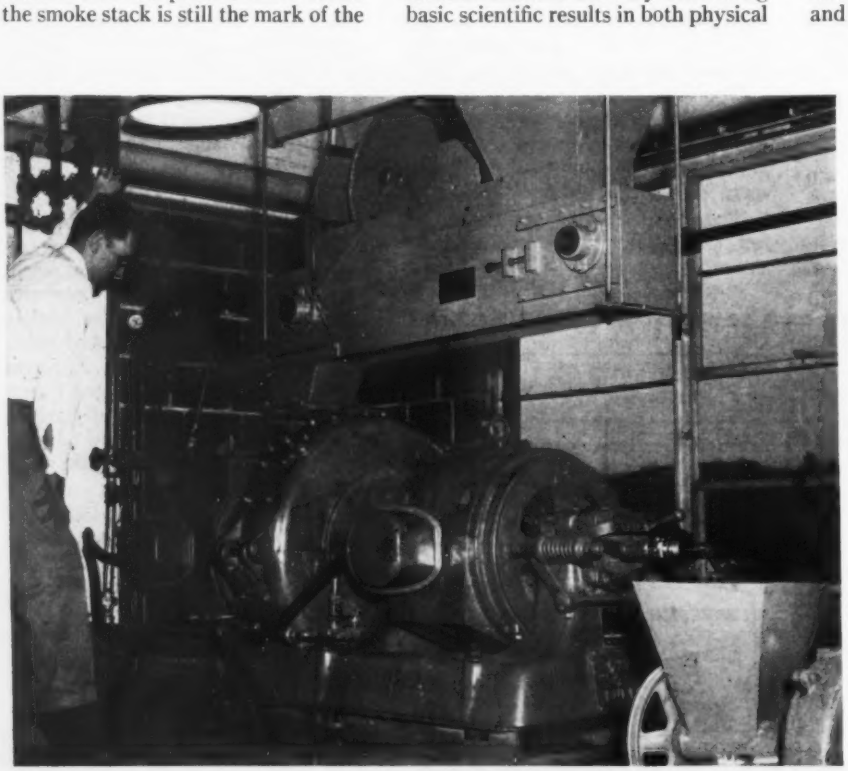
A serious gap still exists between basic scientific research and industrial application. Somewhere in between, expensive pilot plant set-ups must be made. Who will bear the expense—the ultimate user or the equipment manufacturer?

R. H. Plow, present administrative assistant of the Oregon Forest Products Laboratory, hopes to help close the gap with a new emphasis on industrial service, advising both the manufacturer and the user. By correlating basic scientific results in both physical and chemical waste utilization with needs of the mill operator the Forest Products Laboratory hopes to be able to satisfy the investor's pertinent questions on general costs and financial returns.

The medium and small mills have barely begun to be conscious of the trend to utilizing wood waste. More needs to be done in developing mechanical aids to fit the pocket books of these mills. Hydraulic barkers are mostly beyond the reach of mills of this class. Mechanical and chemical barkers have not yet come into general use. There is a big field here. Wide open also is the development of chippers for medium mills.

Chemical utilization has barely been touched. Dr. Kurth is now working on a process for making hardboard out of extracted wood. Some day wood waste may go to an extractor directly from the mill, then to a hardboard plant.

The prospects for full waste wood utilization look good. Hillmann Lueddemann, president of the West Coast Lumbermen's Association, has forecast that complete utilization of wood waste may be only a decade or so off. When sawmill waste is all taken care of then there is still an abundance of culls in the forest. Who knows! Perhaps in the not too distant future even the smallest mill will own a chipper or an extractor, extracting valuable chemicals from its waste, and sending them to a main plant for separation and purification.



IN PREPARATION of fiberboard from waste wood, this attrition mill, or refiner, produces fiber from wood chips. This represents only one of many potential ways to turn chips into profits.

GLASS PIPE

It may be the answer to some of your problems

DEMONSTRATING strength of industrial glass pipe, spike is driven through board without damage to the length of pipe.

By
HAL WARDEN
Plant Manager
Glass Engineering Laboratories
Belmont, California

RELATIVELY RECENT developments in glass technology have imparted surprising qualities of strength, thermal and mechanical shock resistance to special types of glass. As a result, glass pipe is being widely applied to industrial processes where corrosion resistance, visibility, product purity and cleanliness play a governing part in the selection of materials.

In particular, these uses are concentrated in chemical plants, food processing installations, photoengraving plants and other miscellaneous industrial installations where chemicals play a part in the main line of production.

Throughout the Western part of the United States there are several hundred industrial plants utilizing lines made of Pyrex brand industrial piping for a number of different purposes.

Food Processing

One of the most extensive glass pipe installations in the Bay Area is that at plant No. 24 of California Packing Corporation in Oakland. Here a total of 1,000 ft. of 1½-in. diameter glass pipe is used to supply seven different varieties of heated syrup to the machines which pack various types of fruit. Easily detachable couplings permit the connection of any of the ten syruping machines in the plant to any one of the seven syrup lines as conditions require.

Lines are quickly and easily cleaned with hot water and their transparency permits accurate inspection as to cleanliness. Under similar circumstances opaque pipe must be dismantled for cleaning and inspection.

Metal Fabrication

Eitel-McCullough Inc. of San Bruno, California, manufacture electron tubes for communication and industrial application. In the manufacture of these vacuum tubes, internal metallic parts are first fabricated in fairly conventional punching, drawing, forming, welding and machining operations, many of the parts being subjected to a large number of successive operations. Finished parts, therefore, carry many forms of contaminants coming from coolants, cutting oils and other materials, largely of an oily nature.

Because the finished tubes are evacuated to very low atmospheres, it is essential that the parts be scrupulously clean before being incorporated into the glass bulb or envelope in the tube. As a result Eitel-McCullough has extensive chemical cleaning facilities and disposal of the various acids used constituted a rather serious problem until the waste handling system in the chemical cleaning plant was converted to glass pipe.

Milk Collection

A new type of milking system designed and built by Universal Dairy Supply Corporation of San Francisco uses standard 1½-in. glass pipe for the transportation of milk direct from cow to milk can.

In this system, the milking apparatus connects to the glass lines which run into the milk room where they connect with a vacuum releasor. This automatically delivers the milk into a hopper over an aerator from where it can go either into a storage tank or directly into the shipping cans as shown. In this scheme there is no need for a milk pump since the releasor uses the same vacuum pump which

GLASS, which was known to have been used by the ancient Egyptians, has a long history of industrial usefulness. One of the oldest of structural materials, it is finding a greatly expanded application in various branches of industry. This article illustrates several typically diverse installations of glass pipe.

These are the characteristics of glass pipe . . .

INTRINSIC QUALITIES of glass which offer application advantages in industrial piping include:

Corrosion resistance.

Transparency, which facilitates inspection, gives assurance of cleanliness.

Smooth surface which prevents the build-up of deposits or makes them easy to remove; permits easy cleaning and sterilization; protects delicate products against abrasion.

Lightness of weight in relationship with comparable materials.

Electrical non-conduction which obviates electrolytic problems in buried lines.

Relatively low installed cost.

Ease of installation.

By the use of a heat treating process known as tempering, strength of glass used in industrial piping has been materially raised. By this operation permanent residual stresses are established in the body of the glass. These are compressive in the surface layers and act to neutralize tensile stresses which might be applied from external loads. Glass pipe fittings and the flanged ends of straight lengths of pipe are subjected to this treatment.

As a demonstration of the strength imparted, a standard piece of pipe can be used without difficulty to drive a twelve-penny spike through a thick piece of wood. In actual service the result is that breakage is so rare as to be entirely discounted as an operating problem.

Characteristics which make borosilicate glass particularly applicable as industrial piping are its very low thermal-expansion coefficient and its excellent chemical stability. The pipe is made from heavy-wall tubing which is machine drawn for uniformity with end flanges which are accurately pressed and sealed to the tubing.

GLASS SYRUP LINES in Oakland plant of California Packing Corp. Syruping machines at lower right can be connected to any one of seven syrup distribution headers. For a closer view of the connections (plus a touch of artistry), see this month's cover.

STANDARD COUPLING (below) for industrial glass piping. Flanged ends of pipe are tempered to withstand localized pressure of the coupling.

operates the teat cups.

Because of the smooth inner surface of glass piping the possibility of foreign material adhering to these surfaces is minimized. Therefore these milk lines can be cleaned and sterilized without brushing or scouring the surfaces. It is only necessary to circulate detergents or sterilizing solutions through the pipe without dismantling it.

Simple to Erect

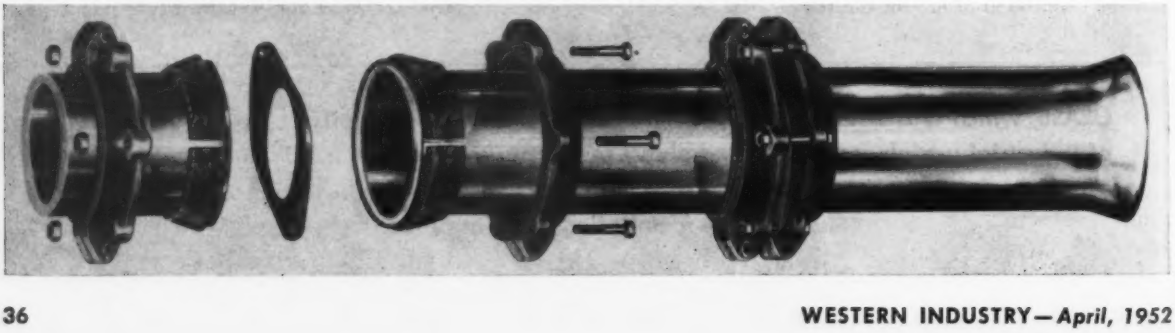
The inner surface of the entire line is available for visual inspection. Thus, if milkstone—or any other deposit which might impair the purity of the milk—begins to form it is immediately apparent and steps can be taken for its removal.

The simplicity of erecting glass pipe is illustrated by the fact that this complete system is supplied to the dairyman as a packaged unit which he installs himself, as the manufacturer says, "without special tools or knowledge . . ."

Fruit Packing

At the Richmond plant of Hills Brothers a 3-in. inside diameter glass line 300 ft. long is used to pump diced fruit from storage tanks over the roof of a building into processing tanks in another building. Tees in the line allow for distribution to different tanks.

In this process the fruit is in the form of ¼-in. to ⅜-in. cubes which



are carried in a corrosive brine. The glass pipe provides protection against corrosion plus ease of cleaning. In addition, because the inside surface of the glass pipe is considerably smoother than that of any other available line, damage to the cubes of fruit is minimized in this pumping operation. Further, experience has shown that contact with metal colors the fruit and tends to degrade the appearance, if nothing else, of the finished product. Besides facilitating inspection after cleaning, the transparency of the pipe in this particular location is an aid in the checking of contents and a safeguard against the accidental mixing of different products.

Fruit Products

In a San Jose plant of California Packing Corporation a 2-in. inside diameter 75-ft. glass pipe line carries fruit nectar from a pumping location to a mixing tank. The nectar (consisting of apricots, pears or peaches which have been crushed and screened) is transported at a temperature of 160 deg. F.

Here the glass line also does away with coloration of the product by metal pick-up. In addition, it solves another problem of a similar nature. At this temperature previous experience was that the nectar cooked onto the inner surface of metal pipes, eventually becoming carmelized, and flaking off to further disfigure the finished product. This problem was eliminated with the glass pipe.

Heat Exchangers

A particularly effective use of glass piping is found in heat-exchanger applications. In the case of cooling operations even though the liquid product being cooled is in itself non-corrosive, frequently the cooling water is corrosive and the exchanger structure is damaged by external attack. Some 20 miles of glass cooling lines were installed during the early years of World War II in the Henderson, Nevada, plant of Basic Magnesium Corp. After several years of active use and a later period of idleness, these exchangers are still in good condition.

Chemical Laboratories

In the Healdsburg, California, high school, the chemistry labs have been fitted with 1½-in. inside diameter glass pipe lines leading from the chemical sinks to the main sewer line. Glass traps similar to those previously illustrated are used. Here the problem was primarily that of protecting schoolroom areas below the chemistry labs from damage by leaking chemicals.

VENTILATING and PIPING

in a food laboratory

BECAUSE design requirements for a good food-processing laboratory are distinctly different from those for a chemical processing operation, Western Regional Laboratory, conducted by the U. S. Department of Agriculture at Albany, California, has set aside special facilities for this type of work.

Of foremost consideration in a food-processing laboratory are absolute cleanliness and freedom from all foreign odors, dust and fumes. A two-story room, along these required lines, has been constructed at the Albany plant. For example, a change of air for the plant can be provided every two minutes by means of four motor driven exhaust fans, located in the ceiling. These fans also serve to remove process heat and moisture.

One factor contributing to the extreme suitability of this plant for food processing projects is a series of piped utility services. These include city water in a 3-in. line; special clean steam in a 3-in. line for open or direct-injection heating; house steam for indirect heating in a 2½-in. line; condensate return in a 2-in. line; clean compressed air (oil-free, water washed) in a 1½-in. line; distilled water in a 1-in. line; vacuum in a 2-in. line; gas in a 1½-in. line; and high pressure water in a 1¼-in. line. These pipes are carried completely around the area, suspended beneath a 4-ft. catwalk for ready access.

Uncontaminated compressed air is supplied by a 75-hp. motor driven rotary compressor which uses water for pressure displacement and cooling of the air. A 50-gpm. booster pump is used to boost the main cold water supply to 150 lb. pressure when necessary.

Odorless steam is supplied from a 100-hp. reboiler heated by house steam and fed with softened city water, which has been preheated, flash deaerated, and further deaerated by vigorous boiling in an open vessel. Steam is condensed in a special condensing unit and condensate is used as a source of distilled water for the entire building.

THE LAB is two stories high. Concrete floor is pitched 3/16 in. toward floor drains that make a complete loop with four laterals.

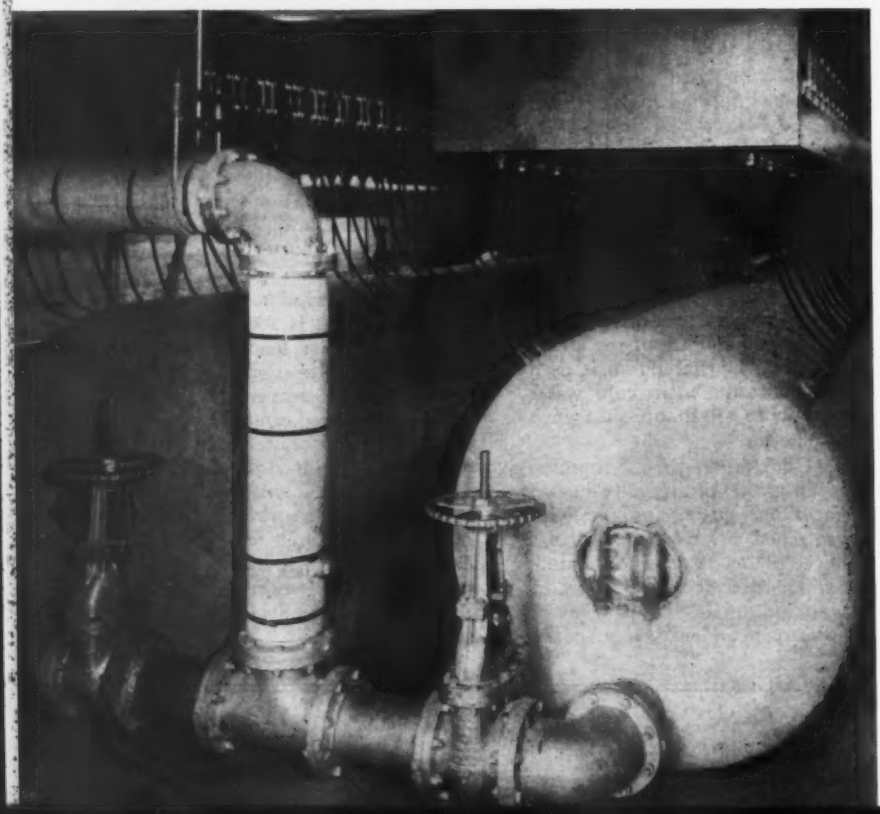
All utility services are valved so that portable equipment units can be readily connected by flexible metallic hoses. In order to make the most of floor space available, processing units are portable insofar as possible. In that way food process lines can be quickly set up, or changed as conditions require.

Water and steam outlets are located at numerous places so that hose lines used for cleaning operations will not encumber the entire floor. As these outlets are supplied through steam-water mixing units, cold, tepid or hot water is available. Where there is a really tough clean-up job to be done, a 600 lb. pressure, 15 gpm. booster pump is used.

Primary electrical power service to the plant is 208-volt, 3-phase; and heavy load connections are made directly from any one of five 225-ampere circuit breakers. Six load center boxes, fed from the circuit breakers, are mounted at intervals on columns above the catwalks; and conduit lines are run from the nearest load center to lighter equipment. Single-phase plug outlets are installed throughout the room to give additional service.

RADIANT HEATING

The new "feel" in industrial plants



RADIANT HEATING is a key feature in the new modern shops of Utah Copper Division of Kennecott Copper Corporation located near the company's open cut mine at Bingham Canyon. This plant provides space for machine, boiler, blacksmith, welding, shovel repair, electrical and carpenter shops.

No Windows Needed

No windows are present in the shop building. Concrete walls are 16 in. thick and 4 ft. high above the floor, thence brick walls 13 in. thick up to the bottom chords of the trusses and 8 in. thick from the bottom chords to the roof. Roof is constructed of gypsum plank 2 in. thick on steel purlins and covered with 2 in. of rock cork insulation and 5-ply built-up roofing. There are six rolling steel doors 15 ft. wide by 20 ft. high in the east wall.

Twelve 30-in., and four 36-in. ventilators are placed in two rows along the peaks of the roof. The ventilating system has fans with 126,250 cfm. capacity, which amounts to approximately three changes of air per hour.

Main shop building has a net capacity of 2,197,960 cu. ft., and the store room, carpenter shop, change room, and compressor room, along the south side of the main building, a net capacity of 248,240 cu. ft., making a total of 2,446,200 cu. ft. to be heated.

RADIANT HEAT COILS were designed on the basis of maximum circulating water temperature of 140-deg. F. drop through the coils. Coils were made up by joining 1¼-in. pipe into 2-in. or larger headers.

WATER HEATING is done in two steel tanks each 30 ft. long and of 5-ft. diameter with ten Calrod Immersion Heaters.

Electricity for Economy

Investigation indicated that electric power would be the more economical energy source since the company operates its own modern electric generating plant. Cost of operating and maintaining a boiler plant (exclusive of fuel costs) for either coal or gas, would approximately equal the total cost for electric power. Maintenance and operating labor costs are slight when using electricity. Heat required for raising temperature inside the building to 65 deg. with 0 deg. outside temperature, and one change of air per hour was estimated at 5,000,000 Btu. per hour.

HERE'S THE BUILDING discussed in this article. It is big and open, quite a heating problem in itself, containing 2,446,200 cu. ft.

The shop was divided into five zones and each zone was provided with independent temperature control. Control equipment was installed with a thermostat inside the building in each zone and another outside working through a duostat.

No Matter What the Weather

This control anticipates changes in the outside temperatures and acts to correct the temperature of the water before the inside thermostat acts. The duostats operate three-way control valves which mix the return water with hot water from the tanks tempering it to the proper temperature to maintain the required temperature in the zone. This control has proved very satisfactory.

The Coil System

Radiant heat coils were designed on the basis of a maximum circulating water temperature of 140 deg. F., with a 20 deg. F. drop through the coils. The coils were made up by joining 1¼-in. pipes into 2-in. or larger headers. Each coil was vented.

A layer of Sil-O-Cel C3 concrete 2 in. thick was laid on the ground to serve as heat insulation and to provide a good surface on which to place the coils. After the coils were placed, carefully leveled and tested, the 6-in. concrete floor was placed.

To care for the extra heat loss through the six large rolling doors in the east wall, and make up for the earth floor in the blacksmith shop where no coils could be placed in the floor, coils designed were placed on adjacent walls.

Heating the Water

Water heating is done in two steel tanks each 30 ft. long and 5 ft. in diameter with 80 ten-kw. Calrod Immersion Heaters.

Operating results for the heating seasons 1949-1950 and 1950-1951 are shown in accompanying tables.

Experience Record

During the 1949-1950 season the ventilating system was operated approximately 50% of the time. Maximum water temperature in the heating tanks was 140 deg. F. except during January when this temperature ranged from 137 deg. to 150 deg. F.

During the 1950-1951 season the ventilating system was operated continuously, which accounts for the higher power consumption than during the previous winter. Maximum temperature of the water in the heating tanks was 140 deg. F. except during December, January, and February when it ranged from 137 deg. to 150 deg. F.

At no time has floor temperature been above 85 deg. F. Building temperatures have been maintained at 65 deg. to 72 deg. F.

Make-up water to the system has amounted to approximately 4½ gallons per day or about 1,100 gallons per season. The system is filled with distilled water in the form of condensate from the company's steam-electric power plant.

Controlling Corrosion

An inhibitor is used to prevent undue corrosion of the heating coils. The make-up is stored in a tank in the same room with circulating pumps and control equipment.

A constant water level is automatically maintained in the expansion tank by means of a small motor driven pump at the storage tank controlled by a float in the expansion tank.

The Results

Results obtained from the radiant heating system have been entirely satisfactory. Estimated heat loss for zero weather was 754.76 Btu. per degree day per thousand cubic feet, as compared with 513.75 Btu. actually obtained for the 1949-1950 heating season and 617.57 Btu. for 1950-1951.

Operating data for 1949-1950 and 1950-1951 heating seasons

Month	Degree Days	Power Used kwh.	Equivalent Btu.	Btu. Per Degree Day Per M cu. ft.
October, 1949	610.7	235,000	802,055,000	536.86
November	711.0	245,000	836,185,000	480.77
December	1,174.9	361,000	1,232,093,000	428.70
January, 1950	1,283.4	473,000	1,614,349,000	514.21
February	890.4	376,000	1,283,288,000	589.18
March	843.2	339,000	1,157,007,000	560.94
April	585.0	209,000	713,317,000	498.47
May	424.7	164,000	559,732,000	538.77
Total	6,523.3	2,402,000	8,198,026,000	513.75
October, 1950	318	138,000	470,994,000	605.48
November	787	316,000	1,078,508,000	560.22
December	1,005	471,000	1,607,523,000	653.80
January, 1951	1,185	431,000	1,471,003,000	507.46
February	879	405,000	1,382,265,000	642.85
March	954	375,000	1,279,875,000	548.44
April	525	271,000	924,923,000	720.20
May	291	224,000	764,512,000	1,073.99
Total	5,944	2,631,000	8,979,603,000	617.57

CHIP GANTRY unloading slabwood chips from open-top box car. Heart of the loader-unloader is a Sutorbilt pneumatic conveyor which creates high vacuum to suck up chips.

AIR IS USED as the propulsion force for carrying logs of over 42-in. diameter past 9-ft. band saw. The wood mill also has numerous pneumatic kickers and niggers, electrically controlled.

How industry can

USE AIR TO GOOD ADVANTAGE

for materials handling and equipment control

THE MAIN AIR SUPPLY—Three 900-cfm. Ingersoll-Rand compressors, each powered by a General Electric 175-hp. synchronous motor.

LOGS 20 ft. long and of 40-in. diameter are reduced to chips at the rate of one foot of log length per second. In ten minutes the chipper can be braked using compressed air.

POWER for chipper is 2,500-hp. General Electric turbine visible at left. Behind turbine is the Ingersoll-Rand compressor which acts as brake for chipper and booster for sawmill air system.

MATERIALS HANDLING and control of equipment are two components of industry in the West that serve, each in its own way, to stimulate competitive enterprise. Fibreboard Products Inc., in the new Antioch, California, plant, incorporates the use of controlled air (both compressed air and vacuum) to reduce the cost of the product produced while maintaining accurate quality control over the process of manufacture.

This is the first plant visited by the editors of *Western Industry* where air is used in such quantity and for so many diverse purposes. At the Fibreboard plant, air is used from the time raw materials are delivered until the finished product is ready for shipment. Here is a quick account of the plant's major uses of vacuum and compressed air:

Vacuum is used for:

1. Unloading dry chemicals.
2. Extracting moisture from paper as it passes over perforated cylinders.

Compressed air is used for:

1. Maintaining uniform cylinder pressure on paper forming machines, and
2. Unloading liquid chlorine.
3. Instrumentation and automatic controls.
4. Braking the chipper.
5. Carriage compressor.
6. Draft fans for the recovery and power boilers.
7. Soot blowing in the recovery unit to keep the flue passages clear.
8. Factory ventilation.

In the factory there are three 900-cfm. Ingersoll-Rand compressors, each powered by a General Electric 175-hp. synchronous motor. When the chipping plant is operating, factory air is supplemented by a 700-cfm. Ingersoll-Rand compressor, powered by the same turbine that drives the 175-in. chipper. This is a 2,500-hp. GE unit.

This same compressor acts as a brake on the chipper (whose disc alone weighs 45 tons, is 175 inches in diameter, rotates at 250 rpm.). In ten minutes the chipper is braked by compressed air as the energy, stored in the huge rotating disc, is consumed by the compressor when the turbine is shut down. Othewise, it would take a good hour or more. This is a great time saver, as it permits changing chipper knives without severe loss of production.

Air for Materials Handling

1. Slabwood chips are shipped to Antioch from various sawmills. At the Antioch Fibreboard mill the chips are unloaded from railroad cars by use of suction (vacuum) created by two Sutorbilt blowers driven by two 150-hp. GE motors.

2. Lime, soda ash, and salt cake (all dry chemicals) are unloaded by use of vacuum equipment similar to unloading chips. Chlorine and resin size (both liquid chemicals) are unloaded from tank cars by displacing the liquid with compressed air. (In this case, factory supplied air is used, at 100 psi. for resin size, and 150 psi. for chlorine.) Two Worthington 150-psi. two-stage compressors do the work.

Compressed air is used to transfer logs from one conveyor to another, from a conveyor to the hydraulic barker (air operates the hydraulic "kickers"), from the conveyor chains to the carriage (carriage is the piece of equipment that holds large logs and feeds them into a nine-ft. bandsaw) and the carriage itself is propelled by compressed air.

Small compressors on the carriage (15-hp.) operate the niggers.

Forced air draft on the bark incinerator is furnished through centrifugal blowers (Rees Blowpipe & Mfg. Co.).

Air for Controls in Pulp Mill

1. Brown pneumatic instrument controls regulate the admission of steam for controlling digesting (cooking) temperature.

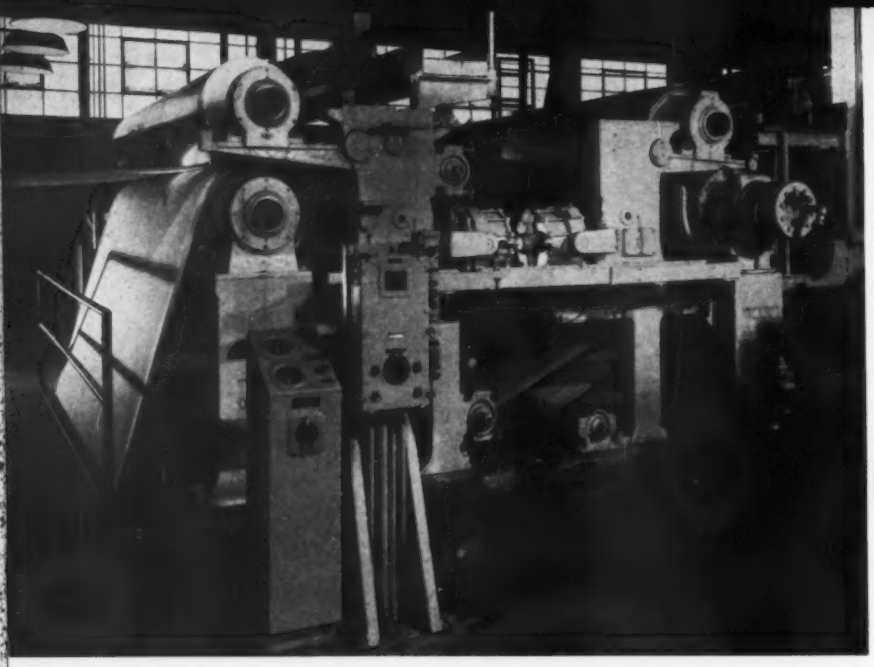
2. Where pulp is separated from cooking liquor, and the pulp is washed with clean hot water, air is used:

a. to measure and control the rate of flow of liquor through each of four stages of washing. Air is controlled through instruments on a panel rather than by individual skill, to assure uniform maintenance of quality.

b. for pneumatically loading press rolls. By squeezing the rolls, it assists in removing liquor from the pulp as it is passed over the washers.

c. to control liquid height in tanks. Measurement is controlled by instruments, maintained by air power.

Valves are pneumatically operated by opening an air control. Some valves



FOR REMOVING MOISTURE, air is used. After paperboard sheets are formed, they pass through pneumatically-loaded presses, which squeeze water out before steam drying.

FOR INSTRUMENTATION and controls, air is used. Brown instruments shown in photo above maintain completely automatic control of pulp washing.

are in inaccessible places, and remote control of an accurate nature is required.

Regulate Bleaching

Air is used extensively through controls during the four stages of bleaching, to regulate flow of stock and addition of chemicals. Here is determined the color of the end product, from the customer's specification. Color must be uniform.

This is the final treatment of pulp before forming into paperboard. No correction (in color) can be made from here on. Electric indicating instruments identify brightness, and hence color density.

During paper forming, air is used:

a. positively, to load press rolls pneumatically. This action helps to remove water from the paperboard before it passes into the dryers.

b. negatively, through vacuum pumps that suck the water out of the felts and paperboard through perforated rolls. (A battery of Nash vacuum pumps are incorporated as part of the Black-Clawson cylinder machines.)

In the drying cycle, vacuum pumps are used to remove air and non-combustible gases from the steam-heated dryers (inside the cylinders). A Ross ventilating system removes high humidity air from the area.

Finished rolls of paperboard are wrapped, edges crimped over, and caps are put over ends of the rolls and pressed into place by pneumatically-operated cylinders.

Air for Controls in Liquor-making and Recovery Processes

Most important function of this department is the ability to reclaim and re-use the plant's chemicals. Controls for these operations are air-activated.

In the evaporators, for example, air controls black liquor flow and steam flow.

Black liquor is used as fuel in a large Babcock-Wilcox recovery boiler. All controls on this boiler (it produces 120,000 lb. of steam per hour at 600 psi.) are pneumatically operated, governed by Bailey instruments. This boiler furnishes, by use of black liquor fuel, about 40% of the steam for the plant's entire use. Such uses include generating electrical power and steam heat for cooking, drying, etc.

Pneumatic Controls

Chemicals from black liquor are recovered as smelt from the bottom of the furnace. This smelt is dissolved in water, then treated with lime in the caustic plant where, after treatment, it becomes cooking liquor for re-use in the digesters. All controls in the causticizing plant are pneumatically-operated for governing flows between various stages.

In the recovery boiler, air necessary for combustion is used for forced draft. Soot blowing, at 350 psi., is supplied by three 150-cfm. Ingersoll-Rand compressors.

Power Plant

Steam turbine generators produce all the power the plant requires—around 11,000 kwh., amounting to some 7,000,000 kwh. per month.

Steam is furnished at 600 psi. from two 160,000-lb. per hr. capacity Babcock & Wilcox type FH water tube boilers plus the recovery boiler. All combustion controls are pneumatically-operated by Bailey instruments.

Steam flow to turbo generators and to processing is pneumatically measured by Brown instruments.

Water Treatment Plant

All water entering this plant is metered by Bailey pneumatic instruments which also control addition of chemicals for clarification. High purity water is a necessity in the manufacture of food containers.

BUSINESS IN MOTION

To our Colleagues in American Business . . .

The fact that a Revere Distributor is now celebrating its 125th anniversary year is an indication of the service the company has given its customers through those years. It is also another proof of the essential function performed by distributors for American industry. Most goods, whether industrial materials such as copper and copper alloys, aluminum alloys, iron and steel, or consumer articles such as refrigerators, radio and television receivers, kitchen utensils and ranges, go through the hands of distributors. Generally speaking, only the large buyers are in a position to purchase direct from manufacturers, who do not find it economical to handle the smaller orders. Yet those orders when pooled in the hands of an organization set up to handle them attain sizable totals, and hence a good distributor account is exceedingly attractive to a large manufacturer such as Revere.

A distributor serves not only the factories from which he buys. He also performs an invaluable service to his customers by making quickly available to them the products they require. A machine shop, for example, may need only a few hundred pounds of brass rod; there is a distributor within easy reach who can furnish it almost immediately. Or a contractor may want a few pieces of steel pipe and a thousand feet or so of copper water tube. Again, the distributor has them. A metal products distributor has to carry such items and an infinite number of others. The Revere Distributor who started in business 125 years ago actually has in stock 53,000 different items, cataloged, indexed, and held in warehouses ready for immediate shipment throughout its territory. Each month this stock is drawn upon by 5,000 to 8,000 customers, each order relatively small. There are many Revere Distributors with similar stocks and offering equal service.

To keep this distributor's warehouses filled with a balanced inventory, 18 people are required in his purchasing staff, which includes specialists in various kinds of materials, machines, tools and supplies. And to serve customers with information, quotations and the like, 25 salesmen are on the go constantly, calling on manufacturers, contractors, builders and stores throughout the busy industrial area in which the distributor operates. The large business done by the company is in great contrast to that of 125 years ago, when it was little more than a hardware store. The enterprise has grown in the American tradition of freedom to prosper in accordance with the principles of reliability and efficiency, fair dealing and integrity in performing a desired function.

Revere Distributors are selected for their ability to serve, and also chosen as to location, so that no matter where you are in this big country of ours, there is a Revere Distributor within easy reach. Today metal stocks may be short due to defense demands but manufacturers are doing everything possible to keep distributors supplied.

If you buy from distributors we suggest you remember that they are not only "central stockrooms," but have a great deal of special knowledge about the products they sell and can give you much helpful advice. Not only that, through the Revere Distributors you can be put in touch with the Revere Technical Advisory Service, which will cooperate with you on matters concerning the selection and fabrication of the Revere Metals. Our distributors, and those of every other manufacturer, render many essential services, both to those to whom they sell, and to those from whom they buy. The distributor system as it operates in the United States arose in response to the need for it. Today it fulfills that need more effectively than ever before.

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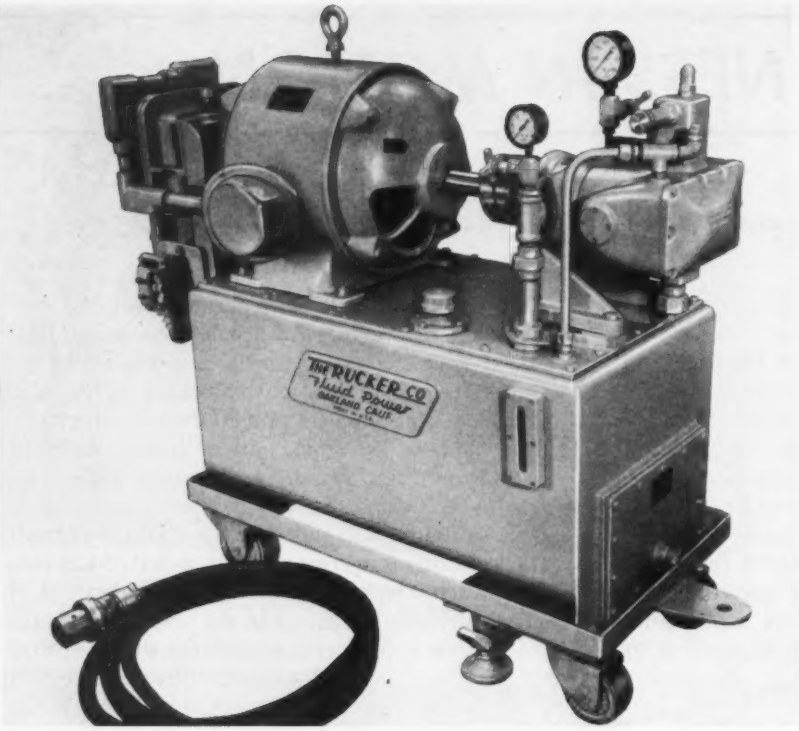

for Convair's Guided Missile Program

▶ One of 22 portable hydraulic power units designed by Rucker for testing hydraulic components in Consolidated Vultee Aircraft's guided missile factory. Variable volume, pressure compensated pump, direct connected to 20 h.p., 1800 r.p.m. electric motor, delivers 7½ g.p.m. at 4000 p.s.i.; maximum 5000 p.s.i. Casters, truck locks and cable, permit use anywhere proper electrical outlets are available. 50-gal. reservoir contains Rucker's new Micronic Filter, constructed so elements can be replaced without draining reservoir.

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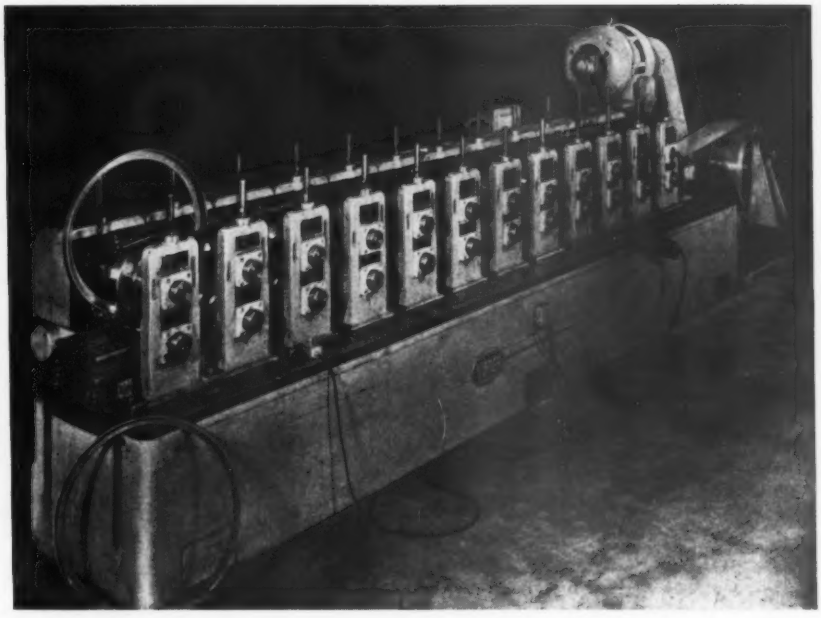


HERE'S the 12-stage Yoder Roll Forming Machine. It's shown in an operation of forming and contouring a 5/32-in. thick aluminum alloy fuel tank ring from coiled sheet stock.

ROLL FORMING

A new fabrication technique

RADICAL DESIGN CHANGES in aircraft (due to jet propulsion and the necessity for producing thousands of economical yet accurate parts for expendable items such as jettisonable fuel tanks) have increased the demand many fold for special roll formed sections. Many such critical parts never before produced in volume readily lend themselves to this form of manufacture because of their lower cost, rather than being machined from bar stock, extruded, or break pressed.

Close Tolerances, Faster Production

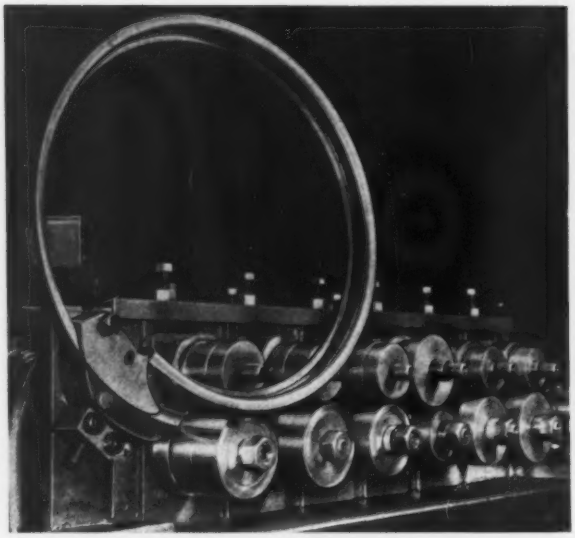
A large number of components heretofore produced by extrusion and the slower break-forming methods readily lend themselves to roll-forming and contouring production. In many instances the forming can be accomplished 50% faster than by the older, conventional methods, with tolerances held to almost unbelievable limits.

Benefits of the newest methods of roll-forming are said to include higher strengths-to-weight ratio for various structural sections, rapid and progressive punching, coiling, notching, fluting and curving. These procedures are accomplished during the continuous cycle of passing the metal through progressive sets of precision-designed roll-forming dies.

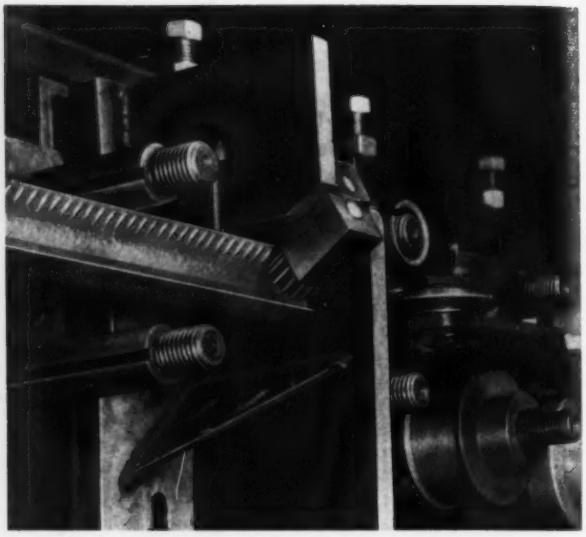
Aircraft Engineers Welcome It

Aircraft engineers, as they become increasingly familiar with the flexibility of roll-forming procedures on aircraft

FORMING and contouring 24ST Alclad Channel from blanked sheet. Channels are fabricated with tolerances of ½ deg. of angularity and .010 flatness. Special treating eliminates warp.



CONTOURING as shown above is ideally suited for all small diameter contouring operations of unbalanced sections. Photo is indicative of the many jet engine parts that can be produced on this type of roll forming machine.



SCALLOPING of edges of part shown above is typical of many diversified operations which can be accomplished simultaneously with progressive cross-section roll forming. Parts can be punched, notched, beveled, fluted, etc.

framing members, will be designing more and more parts with this type of production in mind.

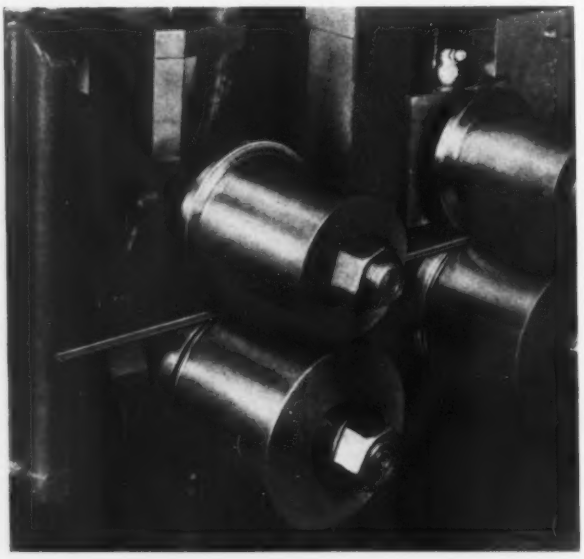
There are many benefits of this process from the design standpoint, such as:

1. Tolerances can be held to almost unbelievable limits depending upon the accuracy of the stock as it comes from the mill, and on the size and shape of the section to be formed (0.001 to 0.005).
2. Almost all of the common metals, cold rolled steel, aluminum, alloy steels, brass, bronze, zinc and copper can be formed.
3. The finish of the stock can be preserved.
4. Properly designed aircraft structural sections have a higher strength-to-weight ratio.
5. Parts can be punched, notched, beveled, fluted, coiled or curved simultaneously with the forming operation.

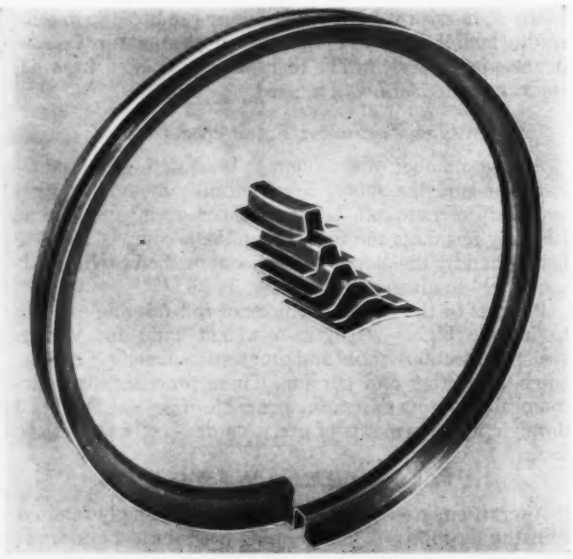
Metals adaptable to roll-forming include cold rolled steel, stainless steel, aluminum, bronze, zinc and copper. Very recent developments, for example, have resulted in the successful forming of straight and circular parts even in the 61ST-T6 material condition, thus eliminating the necessity of heat treating.

All of the pictures shown here were taken in the plant of Aircraft Metal Forming Company, in Burbank, Calif.

HIGH DEGREE of precision possible in finished sheet metal parts by roll forming is illustrated below. Critical guided missile part formerly machined from bar stock is now progressively roll formed to almost unbelievable tolerances from stainless steel coil.



TYPICAL ROLL FORMED circular part 1/8 in. thick of 61S-T4 Alclad flat stock formed into a 30½-in. diameter circular Lat-Section in one pass through the machine. Note the progressive forming stages illustrated by samples cut from the material at each successive stage.



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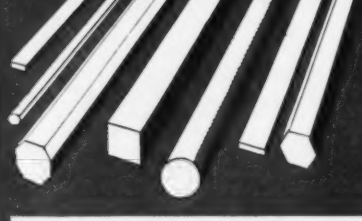

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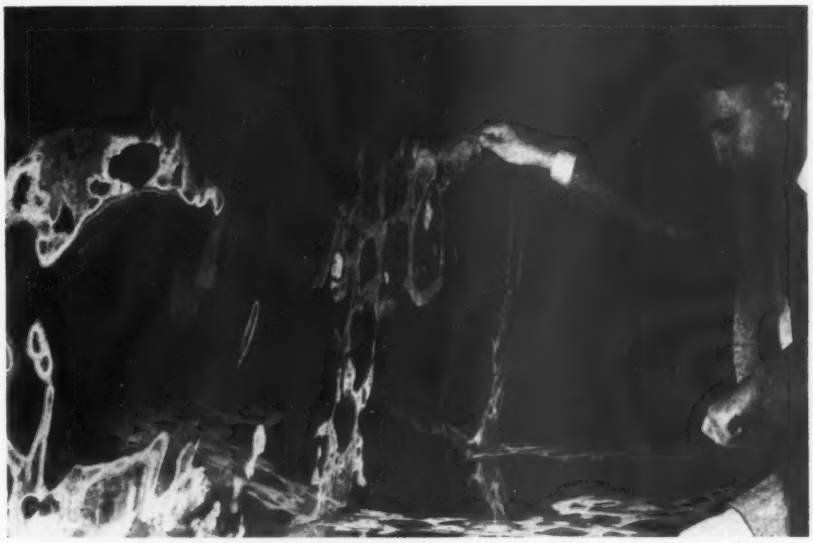


HERE'S THE TROUBLE. **Uninterleaved aluminum flat sheet stained seriously after freezer-sweat box treatment of commercial size stack. This test simulated warehouse storage.**

STAINING of NEW ALUMINUM

At last, here's a way to prevent it

ALTHOUGH ALUMINUM has long been thought to be virtually non-corroding, because of its outstanding performance in a wide range of applications, it has been found to develop surface stains under certain conditions. These conditions include a combination of moisture, a limited supply of air, and pressure against another surface. These are the conditions which may be found to exist in stacks of sheet materials in some warehouses.

Moisture Is the Culprit

Water stains which occasionally appear on the surfaces of stacked aluminum sheet or nested forms after long storage periods are not restricted to this light metal. Most metals and many nonmetals also suffer this type of surface attack. Ordinary window glass is seriously marred by water stains if not properly warehoused. However, the normally high corrosion resistance of aluminum makes these surface discolorations more outstanding to the fabricator who finds them on the metal he has stored.

By

C. C. LACY

and

W. Y. BLEAKLEY

Research Metallurgists
Kaiser Aluminum & Chemical Corporation
Spokane, Wash.

Theories Are Guesses

Mechanism of the water staining of aluminum sheet is not completely understood. Many theories have been proposed concerning the phenomenon, and each of the many investigations being made brings the problem closer to solution. Research studies have shown that the stains have virtually no effect upon the mechanical properties of the metal.

Aluminum, though inherently resist-

STAIN, STAIN — GO AWAY!

IN SPITE of practically anything you can do to avert it, water stains will appear on aluminum—either in sheet form or on the completed products manufactured in your plant.

Aluminum sheet that has been water-stained can be sent back to the primary aluminum producer for re-processing, but the freight and processing expense is unduly high. Aluminum products that are already fabricated, and then water-stained, are not so easily handled; they must be sold at a loss.

Until now, about the only remedies for this situation are those just discussed. Now, however, a real effective means has been produced to prohibit the stains from forming in the first place. Its impact on the profit side of the aluminum producer's and the aluminum fabricator's ledger could be considerable. This article tells you what it is, why it works, and how you can use it.

ant to attack by natural waters, will suffer water stains from atmospheric condensate in a damp warehouse. Laboratory experiments and examination of stained commercial size stacks of sheet aluminum have shown that the stains which occur between the sheets always assume mirror symmetry. These facts have been established by scientific investigation.

Trouble in the Warehouse

Several techniques have been used to minimize water staining of aluminum. One method has been the addition of petroleum-base inhibitors to the engine oils with which some aluminum products are coated to protect them from both moisture and abrasion. These oil-inhibitor mixtures offer good protection against water stains, but unfortunately, oils are undesirable on some sheet products.

Aircraft fabricators frequently specify unoiled sheet when they place orders for aluminum. The aluminum producers interleave the metal sheets with tissue papers to protect the soft cladding of the strong alloys against abrasion. These tissues offer very little protection against water staining.

At times when the aircraft manufacturer receives a shipment of aluminum, he finds that it is necessary to store it in his warehouse for an extended period before fabricating. It is during this period, while the metal is in the warehouse, that the water stains may develop.

With changes in temperature within the warehouse, there are periods when the metal is cooler than the surrounding atmosphere. At such times, moisture is precipitated on the cool metal surfaces. This condensed moisture is then drawn deep into the crevices between the stacked sheets by capillary action. In these minute spaces, the conditions of limited air supply and the restrictive weight of the stack itself combine to favor the formation of water stains.

The Problem Attacked

In an attempt to alleviate this problem the Division of Metallurgical Research of the Kaiser Aluminum and Chemical Corporation began an investigation several years ago. Since the stains always appeared on the contacting surfaces of the sheets of stacked metal, the research men decided to try to find some way to provide the interleaving tissues with inhibitive qualities. A long series of tests was begun in which the investigators impregnated the tissues with a variety of compounds which might be expected to provide some measure of inhibitive action.

Small test packs of aluminum sheet were assembled with impregnated tissues interleaved between the contacting metal surfaces. During assembly, each metal surface was sprayed with distilled water to promote staining. The assembled packs were then bound with aluminum wire, with a cork wedged between the wire and one of the outer surfaces to simulate the pressure caused by weight in full-size stacks of stored sheet. These packs were stored in sealed chambers for 30 days, before being opened for examination.

SURFACE OF SHEETS interleaved with chromate impregnated tissues were unstained after freezer-sweat box treatment. Same tissue may find applications in storing of other vital sheet materials.

Two aluminum alloys were used in the preliminary studies. These were the commercial alloy 3S-H14 and the noncommercial alloy 24S-F, which is especially vulnerable to water staining.

When these extensive tests had disclosed a compound which adequately protected the metal during this "30-day High Humidity Test," the investigation was expanded to include other aluminum alloys. Further studies established the concentration range of inhibitor that offered the greatest protection.

A Solution Found

In the Kaiser Research investigation, chromate compounds were found to give the best protection against water stains in the accelerated tests. A range of 1.5% to 3% of sodium chromate, based on the dry weight of the treated paper, was found to be the optimum.

To carry the investigation still further, a stack of commercial size aluminum sheet was prepared using impregnated tissues, ordinary interleaving tissues, and no interleaving tissues at all between different groups of sheets in the stack. This test stack was then stored in a refrigerator at 32 deg. F. for four days, transferred immediately to a room maintained at 95 deg. F., and nearly 100% relative humidity where it was kept for another four days, and then permitted to air dry for 20 days. This alternate freezer and "sweat box" treatment represented an exaggerated condition of warehouse storage conducive to water staining.

Optimism Upheld

When the test stack was examined, research investigators found that the metal sheets interleaved with ordinary tissues and those not interleaved at all had developed the same stains produced in the laboratory experiments. However, the sheets which had been interleaved with properly chromated tissues were as free from surface defects as they had been when the stack was assembled.

Several paper manufacturers have set up production schedules for preparing these impregnated tissues which should shortly be available for use in protecting all aircraft quality aluminum sheet. It is possible that the tissues may find applications in the storing of other vital sheet materials and nested forms. Investigations along these lines are being contemplated. The entire development of these tissues is protected by the patent rights of Kaiser Aluminum and Chemical Corporation.

Industrial Engineers Join National Group

THE LOCAL society of industrial engineers in the San Francisco Bay area has become affiliated with the American Institute of Industrial Engineers, Inc., and is now known as the San Francisco-Oakland chapter of that organization. D. G. Malcolm of the mechanical engineering faculty at the University of California, Berkeley, is the chapter president.

The AIIE is a national society of professional industrial engineers and is the industrial engineers' only technical society. There are 12 senior chapters and with the new student chapter that has recently been granted charter at the University of California there are now 19 student chapters.

Why *Maintenance Men*

Favor the Allen-Bradley SOLENOID STARTER

ACCESSIBLE TERMINALS
Front connected—easy to get at. Ample space for motor and control wiring. Lots of knockouts.

NO CONTACT MAINTENANCE
Double break, silver alloy contacts never need filing, cleaning, or dressing for perfect operation.

ONLY ONE MOVING PART
One-piece plunger has no bearings to stick, no pivots to corrode. Simplicity means precision.

RELIABLE OVERLOAD RELAYS
Two eutectic solder relays give dependable overload protection. Accuracy unaffected by age.

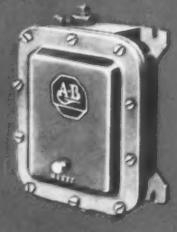
AMPLE WIRING SPACE
Cabinets generously proportioned to provide ample space for wiring. No skinned knuckles.

WHITE INTERIOR
Enclosures have white enameled interiors for visibility in dark corners and easy installation.

COMPLETE LINE
The Allen-Bradley line includes all sizes from Size 0 to Size 7 in all NEMA types of enclosures.

When maintenance men, electrical contractors, and plant engineers were asked, in several independent surveys—"What make do you consider *first* when specifying motor controls?"—they consistently said—"We prefer Allen-Bradley." Why? Because Allen-Bradley starters are so simple. There are no gimmicks like pins, pivots, levers, or linkages to gum up and stick. There is no contact maintenance, so you can install Allen-Bradley starters and forget them. Allen-Bradley starters are *first* because they are so trouble free.

Standard Enclosures for Every Type of Service Condition



A-B Quality

ALLEN-BRADLEY

QUALITY

BULLETIN 709 SOLENOID STARTERS

Allen-Bradley Co.
1316 S. Second Street
Milwaukee 4, Wis.

2-52-M

AVAILABLE IN *Three* HANDY FORMS

START-STOP BUTTONS in cover for 3-wire pilot control

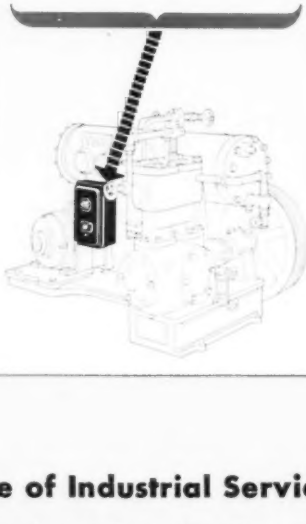
FORM 1 with Start and Stop push buttons for machines where the starter can be located conveniently near the operator.

WITHOUT BUTTONS in cover for 2- or 3-wire pilot control

FORM 2 with plain cover for machines where starter must be operated by remote push buttons or limit switches.

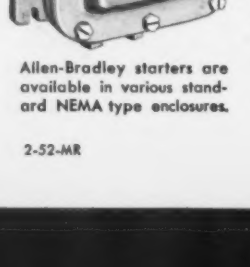
3-WAY SELECTOR SWITCH in cover for 2- or 3-wire pilot control

FORM 3 with Hand-Off-Auto 3-way selector switch for air conditioners, pumps, and other automatic machinery.



ALLEN-BRADLEY SOLENOID STARTERS

in Enclosures for Every Type of Industrial Service



Allen-Bradley starters are available in various standard NEMA type enclosures.

Machinery designers who realize the importance of selecting the right enclosure for each application are specifying Form 1 enclosures with Start and Stop push buttons for many machines, thus reducing the installation cost of control wiring. For machines requiring manual as well as automatic control, they use the handy Form 3 enclosure. All starters are available in a variety of NEMA type enclosures to meet any service requirement. For full information, let us send you the Allen-Bradley Handy Catalog.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wisconsin

A-B Quality

ALLEN-BRADLEY
SOLENOID STARTERS
QUALITY

2-52-MR

Continuous Process For Waste Conversion

A CONTINUOUS process for converting fruit cannery waste into by-products of molasses and pomace suitable for commercial distribution has resulted from a research program conducted over the past three years at a San Jose, Calif., pilot plant, sponsored by the Canners League of California, the Cling Peach Advisory Board, many individual canners, and the U. S. Western Regional Research Laboratory. During the investigation, a few trials and tribulations came up, such as these:

A dejuicing press was developed, which would first filter and then press the treated material. During the 1949-1950 winter months, process improvements eliminated the use of supplemental fiber, which had been a handicap to the process.

In the winter of 1950-1951, important work was done to streamline the whole process. The dejuicing press was redesigned to make it do a better job of separating juice and pomace.

Of like significance was the designing and building of another piece of specialized equipment, a continuous mixer, in which the liming of the fruit waste and subsequent heating of the mixture for the dejuicing press are effected in a steady, continuous manner.

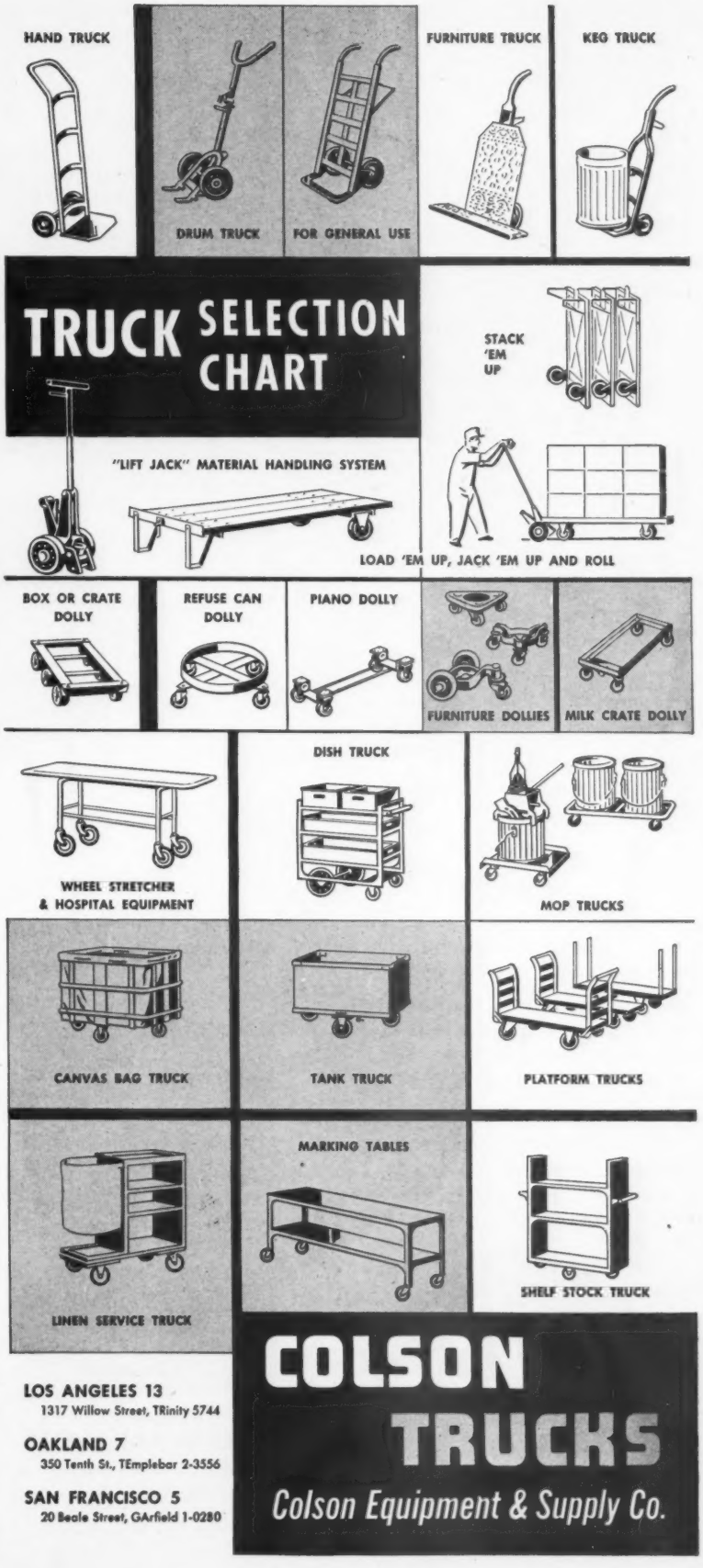
Pipe This One

A NEW TYPE of piping, called Spiral-Weld, is rapidly coming into increased use in the construction, petroleum and agricultural fields because it saves 2/3 of the metal required for comparable standard piping, has high tensile strength combined with light weight and is easy to install.

This piping, manufactured by Taylor Forge and Pipe Works, Fontana, Calif., has spiral lapping, which has much the same effect as solidly welded butt strap, the entire length of each joints. Since this permits use of thinner-gauge walls without sacrificing strength, it makes possible a large saving in metal.

Spiral-Weld is welded by an automatic fusion-weld, submerged-arc process, which is controlled so as to assure a weld of greater tensile strength than the parent metal. Every pipe joint is hydrostatically tested to 80% of the yield point of the steel.

Piping, which is distributed by Republic Supply Co. of Calif., comes in sizes from 6 to 36 in., and in ten different gauges of metal to meet different pressure or collapse specifications.



What do you do when it takes hours... sometimes days... to change v-belts?

1 **Put one or several maintenance men on the job**

...and pay for repairs while production stands still

2 **Pay overtime**

...and have repair costs eat away your profits

3 **Standardize on VEELOS...**

...and change belts in up to 1/10th the time
...save labor, save time and save overtime
...keep machines producing for maximum profit

Comparison proves the value of VEELOS...

Minimum Inventory—4 reels of Veelos in the O, A, B and C widths can replace up to 316 different sizes of endless v-belts. If you use only one width of v-belt you can stock just one reel of Veelos.

Quick Installation—link construction makes it unnecessary to remove outboard bearings.

Complete Adjustability—vibrationless, full power delivery is assured because uniform tension on each belt in a matched set can be maintained.

VEELOS DATA BOOK

gives complete details on construction, installation and uses. We'll gladly send you a free copy of this 28-page fact-full book... write today.

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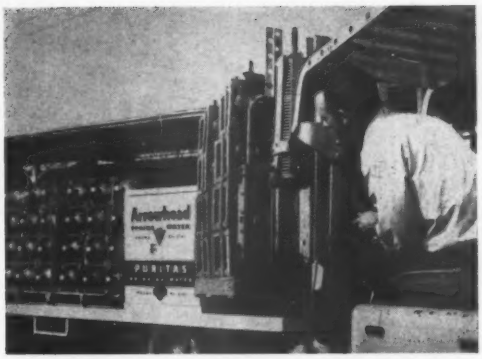
VEELOS
THE LINK
V-BELT

ADJUSTABLE TO ANY LENGTH · ADAPTABLE TO ANY DRIVE

Made in all widths in three types: regular, oil-proof, static conducting. Also in double V in O, A and B. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. VEELOS is known as VEELINK outside the United States.

TRUCK LOADING TIME CUT 50%

by unit load palletizing



CLOSE-UP of fork lift truck loading a pallet of bottled water onto a special delivery truck.

A "BEFORE AND AFTER" story with high industrial interest exists in the materials handling improvements now in use by Arrowhead and Puritas Waters, Inc., Los Angeles.

90 Operations Become 6

Loading of a truck has been cut from 90 hand operations to six operations, and loading time has been cut in half. Effective application of modern materials handling techniques and equipment are responsible for these improvements.

Arrowhead-Puritas bottles and distributes spring and distilled water, from San Luis Obispo south to the Mexican border. Most water is delivered in hundreds of thousands of 5-gallon bottles—bulky, fragile packages which weigh 62 lb. when full.

Main objective was to simplify all phases of handling and delivery of this cumbersome package. Three years and $250,000 were required to complete the job. Here is how they did it:

First, full-scale palletization was installed, eliminating many hand operations. Second, the truck loading procedure was changed. The bottles once loaded vertically, necks up, were loaded horizontally, necks out—which produced a 50% greater load per truck. Third, new truck bodies were designed to accommodate palletization and reduce driver fatigue in load handling.

Loading Time Halved

These basic steps cut the company's loading time in half. Now the 5-gallon bottles in their wooden crates pass from the bottling area by conveyor and are automatically stacked four or five high by a tilter. Each stack is hand-trucked on to a pallet. Forklifts pick up the pallets and speedily load them on to delivery trucks.

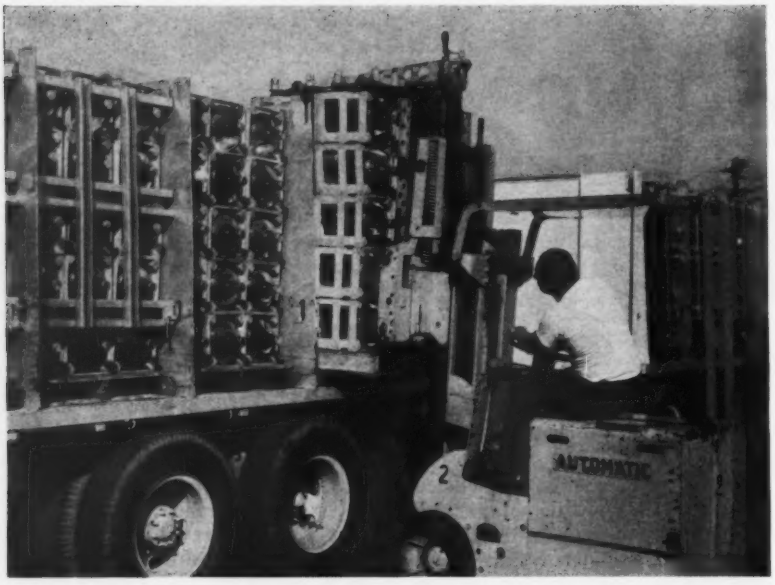
Pallets are constructed of soft wood and measure 36 by 42 inches. Eighteen to 24 crated 5-gallon bottles are carried on each pallet to be loaded aboard delivery trucks, which proceed direct to the consumer. Thirty-bottle pallets are loaded onto transport trucks, which supply the various subsidiary branches located strategically throughout Southern California.

A 24-bottle pallet load weighs approximately 1,500 lbs., while a 30-bottle pallet weighs about 1,900 lb. The fork lift trucks will handle up to 2,000 lb.

Arrowhead-Puritas engineers supervised the designing of a modern, unique delivery truck tailored to the requirements of palletized delivery of bottled water. These bright yellow trucks afford the company remarkable operating economies. Each GMC model FC-302 handles 144 bottles as compared with a peak load of 90 on the old trucks.

This load increase is possible be-

HEART of the palletized operation. At left, freshly filled 5-gallon bottles of water move out of the plant by conveyor belt. They are stacked and loaded onto pallets (center). Then fork lift trucks pick up pallet loads and place them aboard delivery trucks.



LOADING a transport truck-and-trailer combination. Note aluminum partitions, which separate the pallet loads, and special aluminum retainers, which lock the stacked 5-gallon bottles securely into place.

cause of two factors. First, the bottles are now loaded horizontally instead of vertically. This not only permits a greater load per truck, it also lessens driver fatigue materially. The driver now finds the bottles much more accessible with bottles lying on their sides, the bottle necks are closer to the ground. Bottles also slide more easily out of their crates in the horizontal position.

Second factor in load increase is the special truck body, designed to handle pallets. The body is 94 in. wide and will accommodate two rows of pallets, three pallets on each side.

Palletized truck loading created a problem, however, when these crated bottles showed a tendency to intermingle on the truck. This was overcome by the insertion of aluminum partitions on the truck bed—completely isolating each pallet and its crated bottles, and steadying the load.

New delivery trucks are the cab-over-engine type, manufactured without doors. Elimination of doors was another step in lessening driver fatigue, since the average driver climbs in and out of his truck 100 times a day. Doorless cabs are practical in Southern California where mild weather conditions prevail.

Bottles Secured

Again the problem of crated bottles intermingling arose with the transport trucks, but here a different solution was needed since bottles are stacked higher and greater speeds are attained by these trucks on interbranch hauls. Partitions were installed as before. But in addition, Arrowhead engineers developed a 14-gauge aluminum retainer to prevent the bottles from falling outward. Each retainer weighs but 21 lb. less than one-third the normal weight of stakes and wooden sides.

These aluminum retainers fit into the exterior edges of the partitions. The top cross member slips into a notch at the top of the partition. The bottom is secured by western gate locks. The three cross members are rounded on the inside, thus fitting snugly between the bottle necks and holding the load firmly in place.

An interesting feature of the fork lift trucks is the specially designed clamp which grips the top of a pallet load and prevents the crated bottles from wobbling. This mechanically-actuated clamp helps avoid breakage during the truck loading operation.

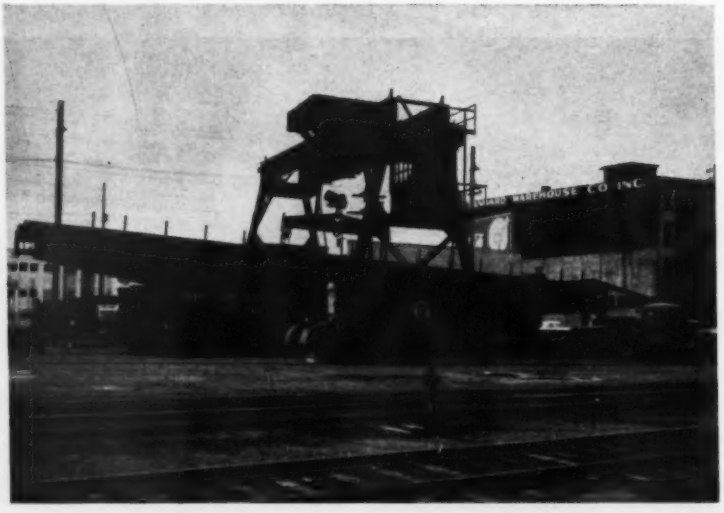
Results of this modernization program are significant. It has increased load capacity of trucks by 50%, but loading time in half, reduced employee fatigue, and it permits faster delivery to customers in handsomer, more efficient delivery trucks.

50-TON STEEL MILL CRANE FOR BETHLEHEM FROM SEATTLE

ONE OF THE LARGEST steel mill cranes ever to be fabricated in the Seattle area was designed to exact specifications for Bethlehem Pacific Coast Steel Corp.'s new electric furnace at its Los Angeles plant by Ederer Engineering Co.

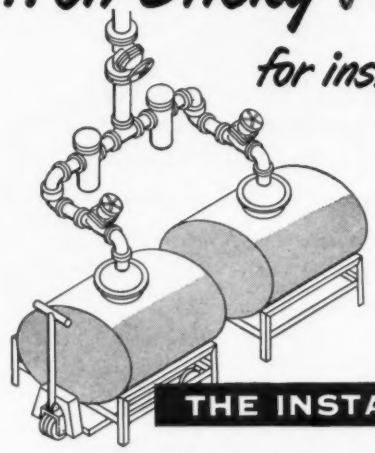
The huge crane, having a 75-ft. span with a 50-ton capacity plus a 10-ton auxiliary, required six flat cars for transporting to Los Angeles.

Although this was not the first crane of its size to be fabricated by Ederer, it was the first one to go into steel mill service in the Los Angeles area. A rush delivery was necessary because of Bethlehem's deadline for switching over from open hearth to electric operation in compliance with recent Los Angeles smog control ordinances.



Do Your Valves Fit Your Job This Well?

... on Sticky Fluid for instance



THE INSTALLATION

Crane Diaphragm Valves on air pressurized liquid latex piping service in paint factory, Adams & Elting Division, The Glidden Company, Chicago.

VALVE SERVICE RATINGS

OPERATION:	Easy - No sticking
SUITABILITY:	Fluid can't get into bonnet
MAINTENANCE COST:	None to date - None indicated
SERVICE LIFE:	No sign of wear
OPERATING RESULTS:	Production delays stopped
PRICE:	In line - No premium
AVAILABILITY:	Stock item in Crane line

THE HISTORY

Conventional valves formerly used in this service were hindered by exposure of working parts to the line fluid. The sticky latex would accumulate in the bonnet and stem threads, freezing the stem, and making valve operation difficult or impossible. With 10 or more operating cycles required daily, the plant faced considerable valve trouble and maintenance expense.

Both trouble and maintenance cost were completely eliminated by replacing with Crane Diaphragm Valves. Their fully sealed bonnet keeps the latex out of working parts. They operate smoothly and do not freeze or stick. So well is the customer satisfied with Crane Diaphragm Valves, more have been ordered for new latex lines.

THE VALVE

Crane No. 1610 Iron Body Packless Diaphragm Valves featuring separate disc and diaphragm. Neoprene diaphragm acts as bonnet seal only; isn't pinched or stressed when valve is closed. Conventional type seating makes positive closure even should diaphragm fail. High flow capacity Y-pattern body has non-restricting interior design. Available unlined or fully Neoprene lined. Consult your Crane Catalog or Crane Representative.

The Complete Crane Line Meets All Valve Needs. That's Why
More Crane Valves Are Used Than Any Other Make!

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

WHAT MAKES a GOOD DAM?

Not just cement and dirt. A tremendous amount of metal fabrication work (measured in tons or dollars) means busy Western industry

SUGAR AND SPICE and everything nice—that's what little girls are made of. Snakes and snails and puppydogs' tails — that's what little boys are made of. But do you know what dams are made of?

Seems there's a lot more to it than cement and dirt. There's a tremendous lot of metal fabrication work amounting to a figure (either in tons or dollars) that looks like the numbers on the side of a railroad boxcar. That means busy Western industry.

Here, for example, furnished by the Bureau of Reclamation are data on some of the dams in the West:

Vital fabricated metal products are installed in a great variety of structures on Bureau of Reclamation projects. Since July 1951, the Bureau has obtained its metal requirements for power installations through allocations of the Defense Electrical Power Administration, and metal requirements for irrigation have been allocated through the NPA.

Fabricated metal at some of the West's big dams

Material	Unit	McNary Dam	Albeni Falls Dam	Chief Joseph Dam	Lookout Point Reservoir	Detroit and Big Cliff Dams	Total
Carbon Steel Plate	short ton	7,211	379	1,964.8	354.9	867.6	10,777.3
Structural Shapes (Heavy) and Piling	"	7,410	541	1,973.7	710.1	956.1	11,590.9
Other Mill Forms and Products	"	25,466	4,625	6,791.3	1,764.9	1,644.7	40,291.9
Alloy Steel	"	607	10	1,079.5	222.2	288.4	2,207.1
Stainless Steel	lbs.	1,050,068	53,300	131,750	42,500	42,600	1,320,218
Copper and Copper-base Alloy Brass Mill Products	lbs.	60,000	8,500	49,500	8,350	19,080	145,430
Copper Wire Mill Products	lbs.	159,000	15,175	96,000	68,558	29,972	368,705
Copper and Copper-base Alloy Foundry Products and Powder	lbs.	229,400	33,000	46,350	36,700	1,200	346,650
Aluminum	lbs.	3,235	—	—	850	4,873	8,958

Grand Coulee Power Plant . . .

This plant, largest ever built by the Bureau of Reclamation, is installed in two powerhouses, one on each side of the dam spillway. The installation consists principally of eighteen 108,000-kw. generating units, nine units in each powerhouse. Total weight of the 165,000-hp. turbines and governors is 1,625 tons; weight of piping and accessories is 225 tons.

Grand Coulee Pumping Plant . . .

Installation of the initial two vertical, centrifugal, motor-driven pumps in this plant, the world's largest, each having a rated capacity of 1,350 cfs. at 310-ft. head, was completed in 1951. Work is proceeding on installation of an additional four units. All six units are expected to be in operation by the end of 1952. The total weight of the pumps and motors is 3,750 tons.

Hoover Power Plant . . .

Now in operation are 15 units and two station service units, one on each side of the river. Two 82,500-kw. generators and one 62,500-kw. generator, presently being installed, are expected to be in operation by this summer. Installation of two 168-in. butterfly valves and one 120-in. butterfly valve, weighing a total of 500 tons, is continuing. Space is provided for one additional 82,500-kw. unit in the Nevada

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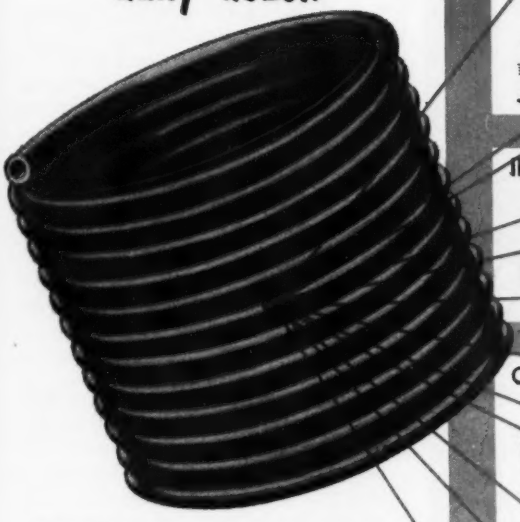

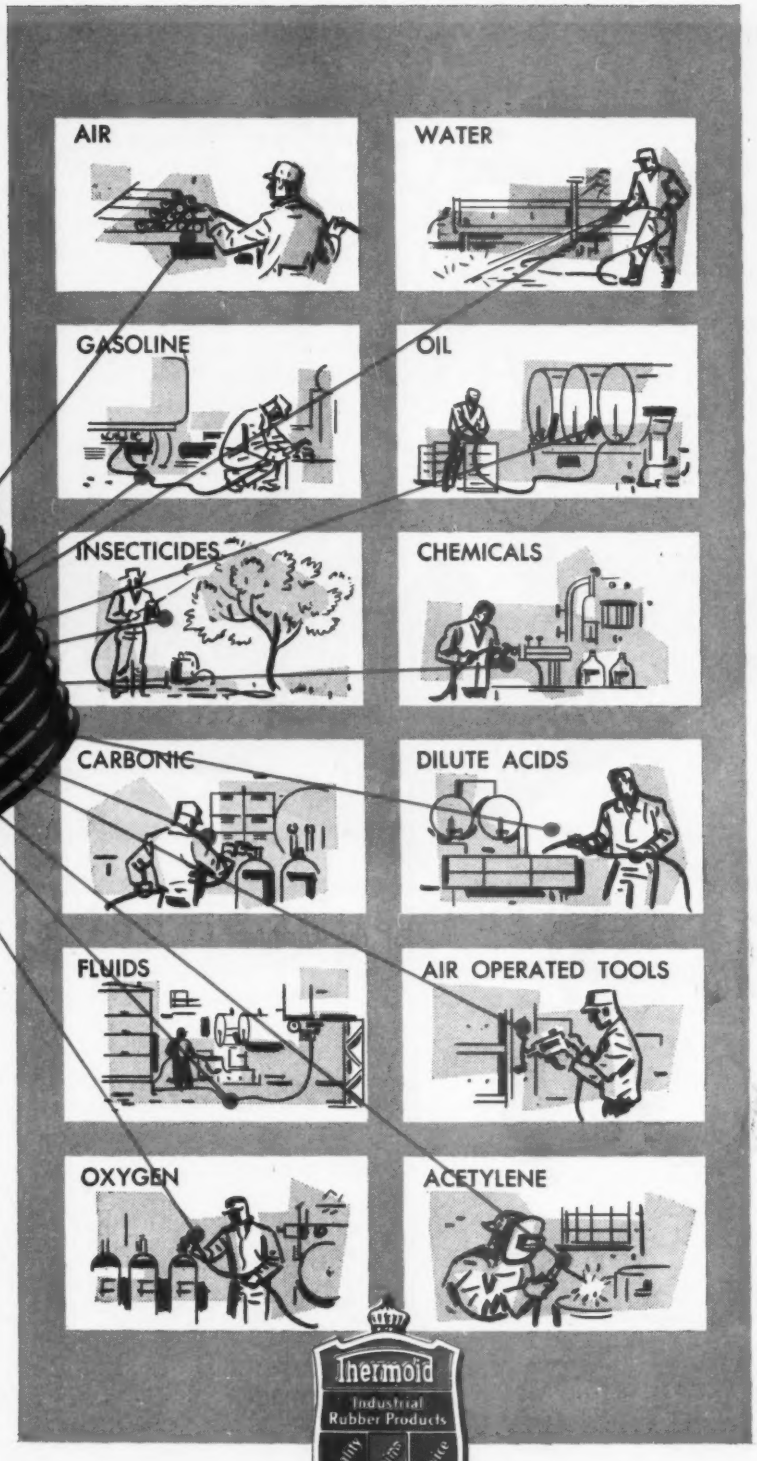

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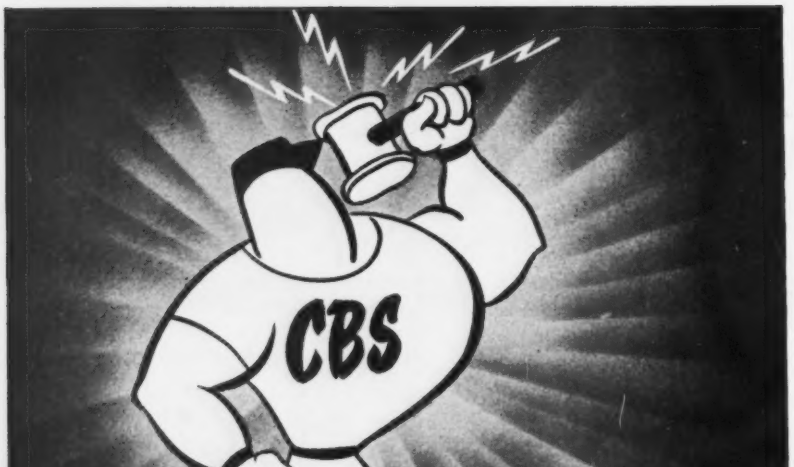

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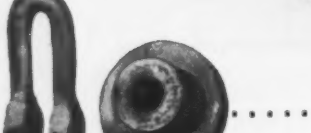
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powerhouse. Total weight of the turbines and governors is 1,465 tons, and the weight of piping and accessories is 290 tons.

At Hungry Horse in Montana . . .

Plant consists of four 71,250-kw. generators. It is expected that two units will be completed in the fall of this year and the remaining two units in the fall of next year. Weight of the four 105,000-hp. turbines and governors is 1,650 tons. Weight of piping and miscellaneous equipment is 325 tons.

Installed on the project in 1951 were the following: four 13.5-ft. diameter penstocks, 1,500 tons; one set of diversion tunnel stop logs, 115 tons; one 10.33 - 10.33-ft. gate and three frames for the outlets, 100 tons; two 290-ton capacity traveling cranes, 550 tons; three 96-in. outlet pipes, three 96-in. ring follower gates, and three 96-in. hollow jet valves, totaling 1,220 tons. Other major metal work to be installed this year including penstocks, gates and frames, gate hoists, trashracks, and gantry crane, total 2,850 tons.

Davis Power Plant . . .

This power plant housing five 45,000-kw. generators, is expected to produce over a billion kwh. annually. The last of these units was placed in operation in 1951. The total weight of the 62,200-hp. turbine and governors is 3,200 tons. Piping and miscellaneous equipment weight is 300 tons.

At Anderson Ranch in Idaho . . .

Anderson Ranch Power Plant, containing two 13,500-kw. generators, was completed in 1951. First generator was placed in operation in December 1950; the second went on the line in July 1951. The two 18,500-hp. turbines and the governors weigh 190 tons, and miscellaneous equipment and piping weigh an additional 60 tons. Provision has been made in the power plant structure for a third 13,500-kw. unit which can be added at a later date.

Canyon Ferry Power Plant . . .

This power plant is under construction on the Missouri River in Montana near Helena. The plant consists of three 16,667-kw. generators. One unit is expected to be placed in operation late in 1953, and the remaining two units are to be completed the following year. The hydraulic equipment includes three 23,500-hp. hydraulic turbines and governors, weighing a total of 530 tons and piping and miscellaneous equipment weighing 90 tons. Installed in 1951 were four 77-in. regulating gates weighing 130 tons.

Installation of four 51-ft. x 34.5-ft. radial gates and hoists, weighing 600 tons, 350 tons of trashracks for the outlet works and penstock, and 125-ton capacity traveling crane weighing 100 tons, is to be started in 1952. Work on placing outlet guard gates, gate frame, fixed-wheel gates, gate frames, and hoists, totaling 250 tons, will proceed during 1952. Penstocks, pump intake lines, and outlet liners, totaling 375 tons, are currently being placed.

Boysen Power Plant . . .

Construction of the Boysen Power Plant on the Big Horn River in Wyoming and installation of its two 7,500-kw. generators is nearing completion. The two 10,500-hp. turbines and governors weigh 220 tons, and miscellaneous equipment and piping weigh 45 tons.

At Flatiron in Colorado . . .

This plant is to house two 31,500-kw. generators and a 13,000-hp. synchronous motor. The motor can be connected in either of the main generator buses and will be capable of reversal for operation as a generator. This power and pumping structure and its integral features is expected to be completed in 1953.

Installation of the two 48,000-hp. hydraulic turbines and one 370-cfs. pump turbine is scheduled to start late in 1952. Total weight of turbines, governors, and the pump is 370 tons; weight of the piping and miscellaneous equipment is 63 tons. A 100-ton gantry crane weighing 150 tons is also scheduled for the plant.

At Pole Hill in Colorado . . .

Pole Hill Power Plant which will contain two 33,250-kw. generators, is expected to be placed in operation by midyear 1953. One of the 47,500-hp. turbines is expected to be installed late in 1952. Total weight of the turbine and governor is 145 tons, and weight of the piping and miscellaneous equipment is 30 tons. A 100-ton capacity traveling crane weighing 85 tons is to be included in the plant's operating equipment.

Programmed for placement during 1952 is a large part of the 7,000 tons of steel plate penstocks for both the Flatiron Power and Pumping Plant and the Pole Hill Power Plant.

And That's Not All . . .

This tabulation covers only seven large multiple-purpose projects recently completed or in progress by the Bureau. Embracing dam construction of other public and private agencies would multiply totals appreciably.

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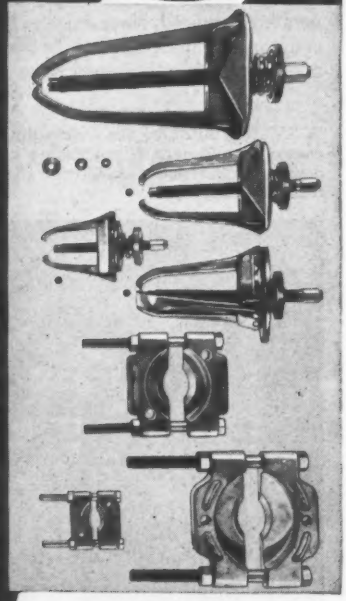

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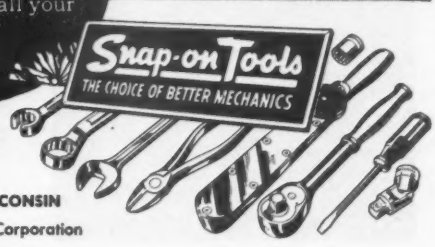

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NEW PAINT FINISHING PROCESS

covers twice the area in half the time

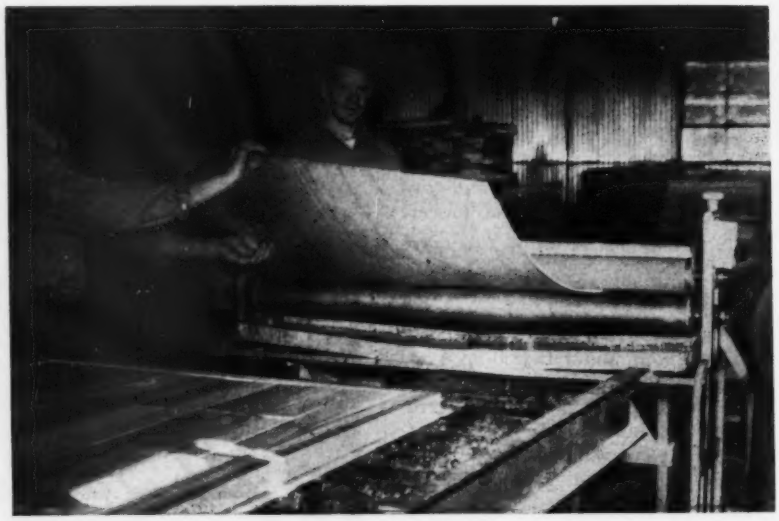
AUTOMATIC roller coating is a new, yet extremely fast and inexpensive, method of applying all types of finishing materials to sheet or plate surfaces—for example, in the manufacture of plywood, plastic laminates, glass, sheet metal, and textile products.

It's Done With Rollers

As developed by L. R. Wallace and Company of Los Angeles, it involves the use of two electrically-rotated coating rollers—horizontally aligned, one over the other—with automatic feed units which make it possible to coat either one or two surfaces of a flat material in a single operation which can be completed in less time than would be required to spray-finish one surface with 50% less area.

Viscous Materials No Problem

Small quantities of solvents or thinners are required, since extremely viscous coating materials can be applied, and defect-free finishes have been consistently produced with virtually no losses of coating compositions where the roller equipment was satisfactorily operated.



THIS IS THE MACHINE that does the job. Virtually all types of sheet or plate materials can be finished with this automatic equipment. Machine may be loaded manually or with automatic accessories.

WOMEN WORKERS use automatic roller coating equipment in processing honeycomb core materials for Aircraft Die Cutters, Los Angeles.

Use of the subject equipment normally involves nothing more than the adjustment of the space between the rollers in conformity with the thicknesses of the materials to be finished in each case, and the feeding of materials into the space between the rotating rollers—either manually or with automatic-conveyor equipment, depending on the type of work and the amount of production that is required in each circumstance.

15,000 Sq. Ft. An Hour

As many as 15,000 square feet of a material, 48 inches wide, have been roller coated in one hour; and, where organic finishing materials were utilized, a gallon of coating solution has covered up to 850 square feet of a deposition surface.

As shown in accompanying illustrations, a typical roller coating unit comprises two neoprene-covered steel rolls and a pair of steel "doctor" rolls mounted on a simple structural steel frame and powered by a ¼-hp. electric motor. A hardened and ground roller chain powers all rolls, so that the doctor rolls will continuously apply a smooth film of a fluid coating material to one or both of the rubber-covered finishing rolls—which, in turn, transfer the film to one or two surfaces of materials passing between the rolls. Spaces between the respective doctor and coating rolls serve as reservoirs for liquid materials, and drip-proof end plates prevent the loss of coating solutions while the machine is idling or in motion.

Lengths of the coating rolls determine the widths of the materials that can be finished with each unit, and to date these have ranged from about 20 in. to 52 in. However, longer or shorter rolls could be used if necessary.

Not Yet Fully Developed

The amount of pressure exerted by the coating rolls on materials which must be finished is somewhat variable, depending to a great extent on the viscosity of a coating solution, but this would scarcely be sufficient to damage the most fragile deposition surface because the eventual transfer of coating materials is the result of surface tension—a phenomenon which is, incidentally, responsible for the transfer

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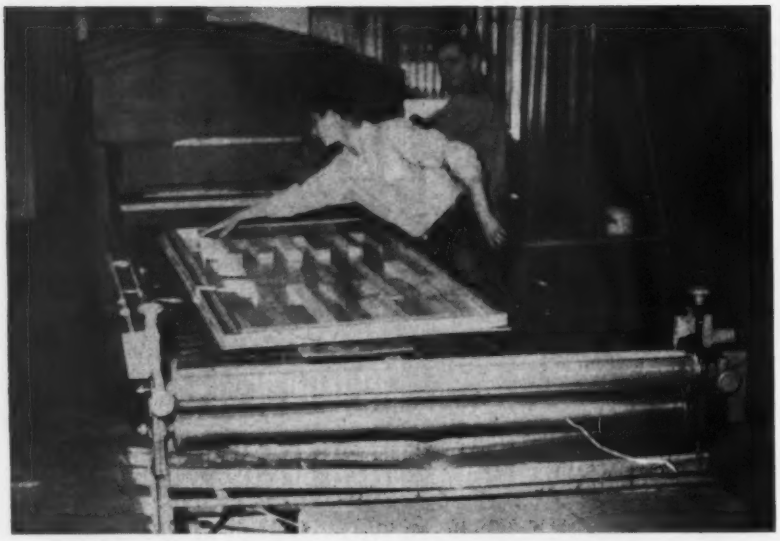

WOOD CORE MATERIALS are stacked on an adhesively-coated facing veneer prior to the lamination of a heavy wood panel. The facing veneer's adhesive coating was applied by the roll-finishing unit in center of photo. Behind worker's hand is a steam-heated press in which the adhesive bonds of the panel will be cured.

of ink to paper in the operation of the well-known offset printing press.

Despite the operational similarities of automatic roller coaters and offset printing equipment, it is curious to note that no particular efforts have yet been made to adapt this equipment to operations involving the use of masks or stencils. However, such equipment has performed many other tasks which are unusual to the extent that it was specifically designed for the application of lacquers and enamels. For example:

(a) Resinous adhesives such as Lauxite and Weldwood have been roller-coated on laminae for plywood and "honeycomb" structural assemblies with greater speed and more consistency than might be expected where ordinary "glue spreaders" are utilized.

(b) Photosensitive emulsions have been roller-coated on wood, paper, glass, and many similar surfaces in absolute darkness where it was desirable to reproduce line or halftone material on the surfaces with standard photographic processing equipment; and, insofar as is known, comparable results could not otherwise be attained in the application of photosensitive coatings without thousands of dollars' worth of specialized darkroom finishing equipment.

(c) Roller coating machines have been used to apply standard sizing compounds, dyes, inks, and elastomeric resins to leathers, fabrics, plastic films, etc., with as much efficiency as could be anticipated where far more expensive processing equipment could serve the same purposes.

(d) Extremely viscous grease-and-wax lubricants have been roller coated on sheet-metal blanks so that the latter could be stamped without the sort of friction that causes tool marks and excessive work hardening. Incidentally, while most sheet materials are greased prior to forming operations, lubricants of the type in question have not to date been used to any great extent on stamping stock because they could not be applied with reasonable efficiency—despite the fact that they have long been recognized as superior friction-preventers. Where automatic roller equipment is employed, the "undesirable" viscosity of the best sheet lubricants becomes an advantageous physical property.

If necessary, fluids applied with automatic roller equipment could be preheated to 200 or 300 deg. F. without damaging the neoprene-covered rolls. However, such preheating might require the use of special finishing accessories not yet developed.

As heretofore intimated, roll-processing equipment is not new in principle. Rubber manufacturers have used such devices to callender sheet stock and painters have employed manual roll-finishing units in place of brushes and spray guns for a period of many years. Yet, prior to the development of the Wallace machines, there were no low-cost roller units which could meet a variety of high-speed industrial coating requirements with comparative efficiency.

Accordingly, it seems fairly safe to say that automatic roll coating is a Western industrial prodigy that should enjoy an extremely bright financial future.

Air Locks for Atomic Workers

ATOMIC PLANTS and laboratories are taking a lesson from the diving fraternity and setting up "air locks" between "hot" and "cold" pressurized zones to protect personnel against deadly air-borne contamination, it was disclosed at the spring meeting of the ASME at University of Washington.

In designing for directional control of air flow, according to W. W. McIntosh, staff engineer, General Electric Co., Richland, Wash., one method is to provide controlled differential air pressure between areas of different degrees of hazard. These areas are usually designated as zones, the uncontaminated areas being termed "cold" and the areas of greater risk termed "hot."

"Zones of different hazard levels are completely separated structurally," McIntosh explained. "Access between zones is through air locks. Within each zone air is supplied to areas of least risk and exhausted principally from equipment, hoods or other areas of highest risk. Ventilation balance within the zone is such that flow through doorways is always toward the more hazardous side."

Gasket Sealer

JAMES J. BRESLIN of Burbank received a $200 suggestion system award from the Air Materiel Command for inventing a key-lock joint for sealing cork impregnated gaskets on all square and rectangular cover plates and closures used on U. S. Air Force mobile radar trailers. Previously all gaskets were butted together flush, often arriving at assembly areas with the joint separated as much as 3/16 of an inch, resulting in leakage at joints during water test. Such leakage could result in serious electrical failures to radar units in the field. Wherever butt separations existed previously, it was necessary to replace two sides of the gasket.

German Metal Casting Process Described

Information on a metal casting process which was originated in Germany and fully developed by U. S. Navy metallurgists is available through the Office of Technical Services of U. S. Department of Commerce.

This shell molding process uses a thin walled (shell) mold produced by mixing dry sand and plastic bonding agent. "Plastic Bonded Shell Molding Simplified" (PB 105 131). 6 pages including photographs, sells for $.25 a copy.

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The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn. Pacific Coast Factory Distributor: F. Somers Peterson Co., San Francisco, Los Angeles.

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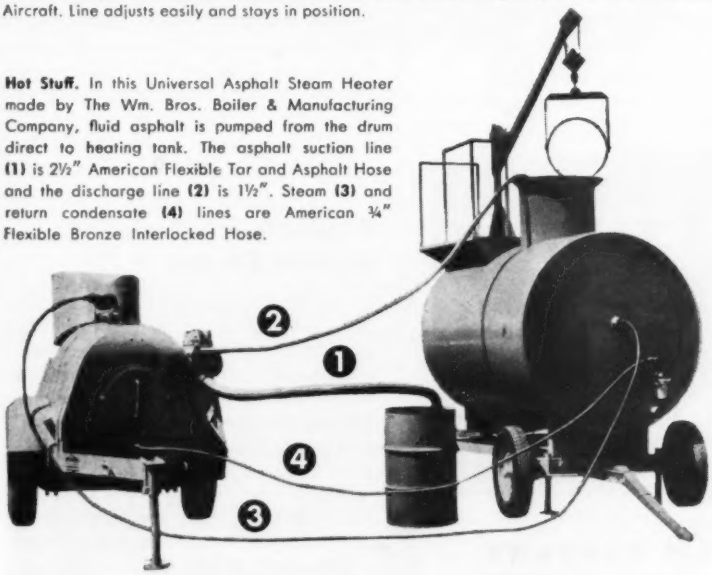

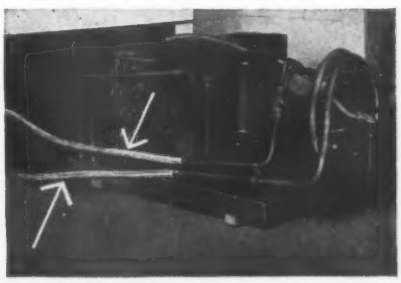

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Liquid Plastics Coming Up in the Stretch

LIQUID PLASTICS, such as plastisols, plastigels and organosols, are fast replacing rubber latices for dipping, coating and casting, and are also replacing milled plastics which have been used for molding and calendering, according to Dr. R. V. Yohe, president of American Anode, Inc., subsidiary of The B. F. Goodrich Co.

Rubber latex is used in the manufacture of foamed rubber, rubber products made by dipping and coating processes, and various protective coats; however this facet of the rubber industry is threatened by rapid development of liquid plastics, which are also being used to make products not before possible with latex. It is estimated that as much as 25% of the over-all plastics manufacture in this country is being utilized in this way.

The latex industry plans to recapture markets by taking advantage of the many opportunities offered by water dispersions of rubber latex and liquid plastic combined.

New Alloy Means New Uses for Aluminum

A NEW ALLOY, consisting mostly of zinc, but also including aluminum, brass, lead, tin, silver, nickel and chemicals, will not only revolutionize the art of soldering and welding aluminum, but will allow for many new uses of aluminum in industry, according to Samuel Freedman of Santee, Calif., who developed this alloy.

New material, called "Chemalloy," will eliminate problems which have long made aluminum one of the most difficult metals to weld or solder. With this alloy, it will be possible for a housewife to repair an aluminum pan just by heating the solder in a flame.

Production Scheduling Experts Sought

PERSONS QUALIFIED in production scheduling in metal products, machinery, electrical and electronic equipment, aircraft and scientific equipment are needed by the National Production Authority in Washington, D. C., for production scheduling in defense programs.

These jobs will pay from $8,360 to $9,600 a year. Qualifying experience in industry must be at comparable levels.

For complete information and application forms, apply at once to any first or second-class post office, civil service regional office, or the U. S. Civil Service Commission in Washington, D. C.

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Legs for lethal eagles – hydraulic landing gear that cushion Uncle Sam's big bombers as they come down to roost – this is just one of the many uses of OSTUCO Tubing by manufacturers in the progressive aircraft industry. Aircraft designers are specifying OSTUCO Tubing for fuel lines, engine mounts, landing gear, and many other applications because of its inherent strength without weight characteristics and the ease with which it can be machined, formed and fabricated to the most exacting requirements.

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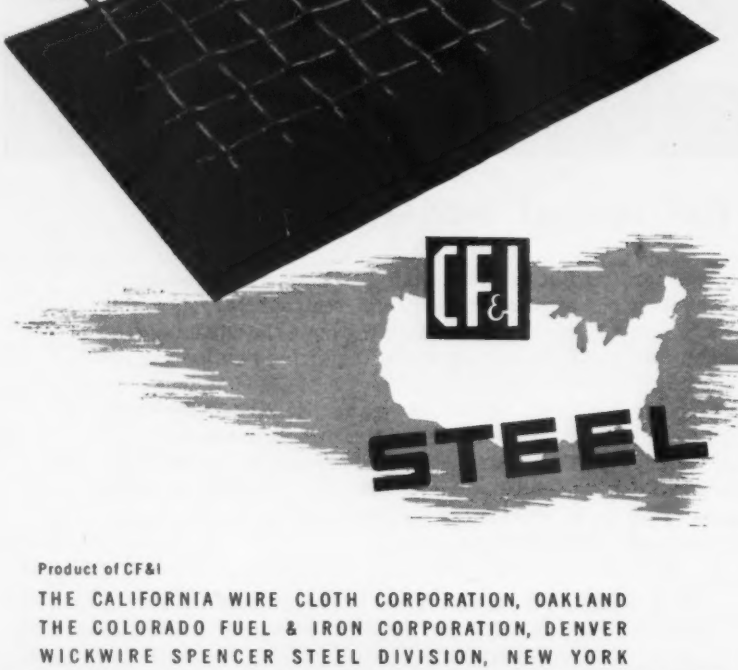
Since 1859

Cal-Wic Screens are woven to various specifications to meet most any screening requirement. Many types are available from stock.



Product of CF&I

THE CALIFORNIA WIRE CLOTH CORPORATION, OAKLAND
THE COLORADO FUEL & IRON CORPORATION, DENVER
WICKWIRE SPENCER STEEL DIVISION, NEW YORK

CAL-WIC INDUSTRIAL SCREENS

THE COLORADO FUEL & IRON CORPORATION CF&I

Where "Hair-Splitting" Becomes a Profession

ONLY A SMALL PORTION of parts machined at Westinghouse Electric Corp.'s Sunnyvale, Calif., plant can be measured by ordinary means. For this reason the firm maintains a precision measuring laboratory where a "hair's breadth" is considered hardly more than a rough approximation. The laboratory, equipped with the latest

TOP — For determining thickness of a part, this Sheffield comparator is used. With help of a "Hoke" block, comparator is adjusted to within two-millionths of an inch. When part is inserted, variation is shown by shadow cast on scale graduated to 50-millionths of an inch.

CENTER — Set of 85 "Hoke" blocks, ground and lapped to surface accuracy of three-millionths of an inch, can be used to provide more than 120,000 gauging lengths.

BOTTOM — Greatly enlarged image of small metal part is projected on comparator's screen. Part is on table below screen in the beam of a brilliant light source. Each thousandth of an inch of part can be magnified to appear as one-tenth inch on screen.

in precision measuring instruments, represents an investment of more than $50,000.

A staff of trained technicians keeps an eye on accuracy of company-owned instruments and gauges, and also maintains a constant check on tools personally owned by workers throughout the shop.

Laboratory is completely air conditioned. Lights there burn 24 hours a day to prevent changes in temperature of even a few degrees, which might affect accuracy of precision instruments.

California's Gas Furnace Industry Expanding

BECAUSE of its superior products, California gas furnace industry is selling approximately 27% of its equipment outside the eleven Western states, despite higher manufacturing and shipping costs, according to California State Chamber of Commerce.

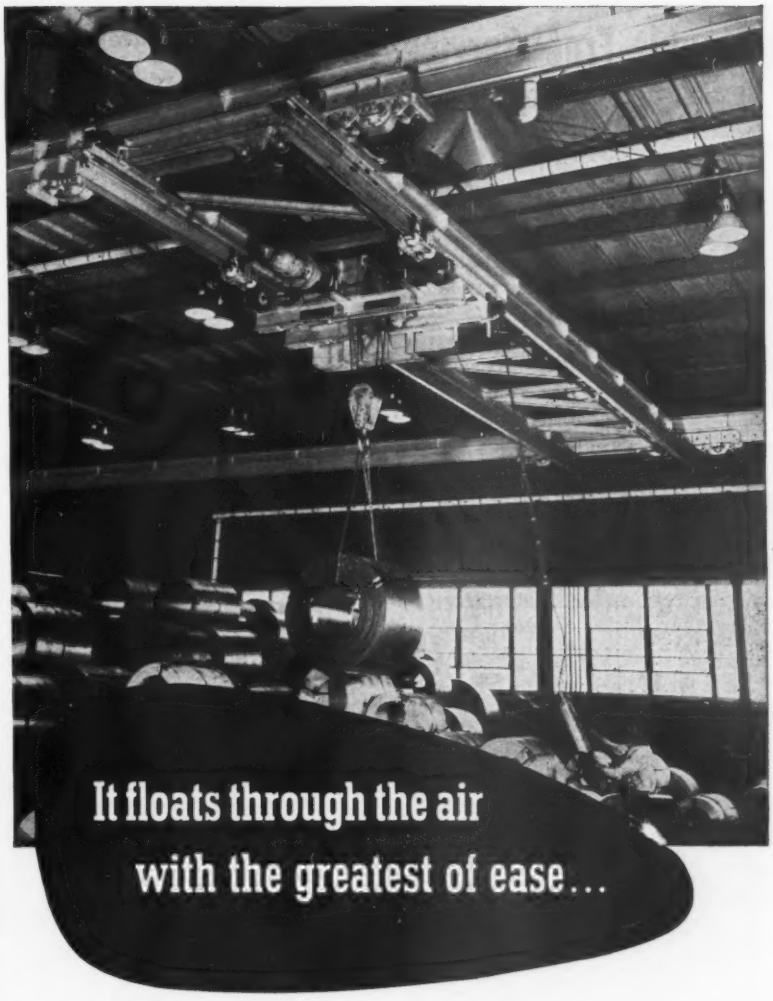
The Chamber's industrial plant location committee, which is conducting a series of industrial economic studies, points out that government restrictions on housing in California are limiting the number of new customers for gas heating equipment in California. For this reason the industry is looking for markets in the local industrial heating field, and to the Eastern and Northwestern markets. Market prospects in California for smaller firms making customized equipment are still very good.

New pipelines being put into operation in eastern and northwestern areas will create a great sales potential east of the Rockies for these manufacturers of gas equipment. Possibility of importing Canadian natural gas into the Pacific Northwest offers another bright spot for markets in that area, since the potential would then include every house within connection range of a gas main, plus the inevitable natural expansion of the area.

Air Force Procurement Office Moves

SAN FRANCISCO-Oakland Regional office of the Western Air Procurement District has moved from temporary location at 405 14th Street, to 1515 Clay Street, Oakland, California, says an announcement by Major General William M. Morgan, USAF District commander.

According to Major Bert R. Eckstein, Air Regional Representative, the new expanded facilities will more easily accommodate fabricators and suppliers who seek to do business with the Air Force.



when handled by

AMERICAN MONORAIL CRANES

One man easily unloads, stores and moves seven-ton coils of steel with this 10-ton American MonoRail Crane. These cranes furnish efficient operation where low headroom is a critical problem. Interlocking devices permit carrier to travel beyond craneways. Loads are moved over maximum area. Articulated trolleys assure perfect alignment of trucks for smooth crane travel. American MonoRail Cranes are ruggedly built to handle loads up to 10 tons at operating speeds of 500 feet per minute.

Let an American MonoRail engineer tell you about these fast-moving constant-service cranes.

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Irving G. King Co.	Robert M. Taylor Co.	Gamble-Hawkins Co.	F. T. Crowe Co.
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THE AMERICAN MONORAIL COMPANY

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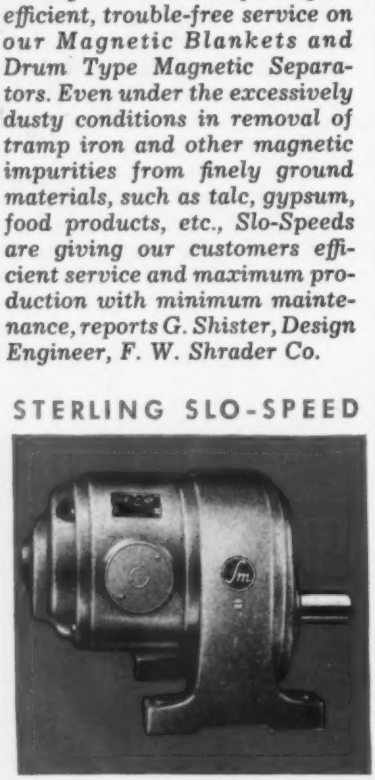
Trouble-Free Service With Slo-Speed Reported by Mfr.

Totally enclosed Slo-Speeds give efficient, trouble-free service on our Magnetic Blankets and Drum Type Magnetic Separators. Even under the excessively dusty conditions in removal of tramp iron and other magnetic impurities from finely ground materials, such as talc, gypsum, food products, etc., Slo-Speeds are giving our customers efficient service and maximum production with minimum maintenance, reports G. Shister, Design Engineer, F. W. Shrader Co.

STERLING SLO-SPEED



GIVES YOU THE ONE BEST LOW SPEED AND

gives uninterrupted service — carries heavy overhung loads — provides versatile mounting and flexibility in arrangement of machinery — saves valuable space — provides greater safety — costs less to install and use. An indispensable source of low speed power for:

Agitators	Dryers	Presses
Blenders	Feeders	Pumps
Blowers	Kilns	Screens
Conveyors	Mills	Tumblers
Cookers	Mixers	Etc., etc.

70 ILLUSTRATIONS showing how Sterling Electric Power Drives reduce production costs. Write for Bulletin No. D-131.

STERLING ELECTRIC MOTORS

Plants: New York City 51; Van Wert, Ohio; Los Angeles 22; Hamilton, Canada; Santiago, Chile
Offices and distributors in all principal cities

Montana Metals Set New Production Records

FOR SEVERAL years zinc production in Montana, measured by weight, has exceeded that of copper; but 1951 is the first year in which the dollar value of zinc also exceeded copper.

Zinc has now become the most important mineral product of Montana in point of value. Manganese production showed a decline. On November 5, last year, the Victor Chemical Co. made the first shipment of elemental phosphorus from Montana from its plant at Selver Bow. A shipment of uranium ore was also reported from Jefferson County. Last year also saw increased activity in the exploration and development of tungsten deposits in four counties of this state.

Mineral production of Montana for 1950 and 1951

Product	Unit	1950 Quantity	1950 Value	1951 Quantity	1951 Value
Coal	short ton	2,520,166 a	$ 5,871,987	2,344,000 c	$ 5,860,000 b
Copper	pound	108,956,000 d	22,841,956 b	111,226,000 d	27,027,918 b
Gold	fine ounce	51,764 d	1,811,740	28,752 d	1,006,320
Lead	pound	38,238,000 d	5,203,176 b	43,472,000 d	7,433,712 d
Manganese ore	long ton	135,000 d	6,750,000 b	102,000 d	5,872,000 b
Natural Gas	M cu. ft.	39,186,000 d	11,127,342 e	39,300,000 g	11,161,200 e
Natural Gas		.....	2,079,402 f	.....	2,082,900 f
Natural Gasoline	gallon	10,542,000 d	790,650 b	11,592,000 d	869,300 b
Petroleum	barrel	8,108,123 h	19,953,332 b	8,972,000 h	22,430,000 b
Phosphate Rock	long ton	210,165 d	1,496,537 d	.....	(i)
Silver	fine ounce	6,327,025 d	5,726,277 k	6,054,653 d	5,479,767 k
Stone, crushed	short ton	919,090 d	949,545 d	.....	(i)
Vermiculite	short ton	.....	5,865,886 l	.....	6,500,000 l
Zinc	pound	135,356,000 d	19,373,540 b	168,410,000	30,145,390 b

a—U. S. Bur. Mines Mineral Yearbook preprint. b—Estimated. c—U. S. Bur. Mines Weekly Coal Reports. d—U. S. Bur. Mines Mineral Market Reports and Monthly Reports. e—Estimated value at point of consumption. f—Estimated value at wells. g—Interstate Oil Compact Commission, Compact Comments. h—Oil Conservation Board of the State of Montana. i—Included under Miscellaneous. k—Based on government price for newly mined silver. l—Estimates based on news story, MAM News Letter.

JOHNSON GEARS

SPUR • HERRINGBONE
WORM • HELICAL
STRAIGHT & SPIRAL BEVEL
RACKS • SPROCKETS

GEAR CUTTING
GRINDING
MACHINE WORK
HEAT TREATING
RIGHT ANGLE GEAR DRIVES

MEMBER OF AGMA

Standards That Assure Quality Gears

Into every gear-cutting job at the Johnson plant goes an engineering knowledge and an experience gained through nearly half a century . . . solving problems and manufacturing gears for highest efficiency and dependability. The more particular you are in selecting gears, the more likely you are to choose Johnson.

JOHNSON GEAR AND MANUFACTURING CO.
45 YEARS SERVICE TO INDUSTRY
8th & PARKER STS.
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Indian Red Schoolhouse For Business Executives

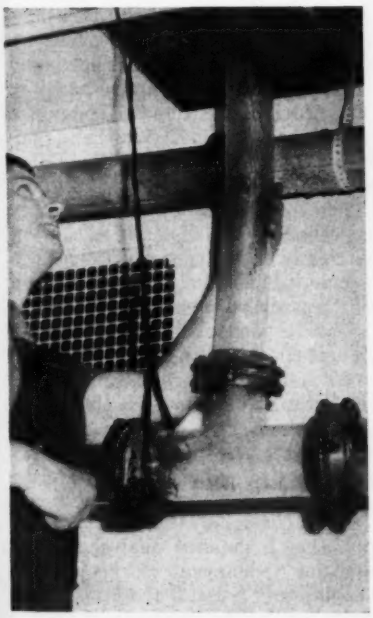
A NINE-WEEK summer training program for business executives will be conducted at Stanford University's Graduate School of Business from June 23 to August 22.

Paul E. Holden, Stanford professor of industrial management, will direct the program, which will present the over-all company viewpoint and emphasize the unity of management and the control, coordination, and integration of its various activities. The case-problem method of instruction will be used, and classes will be conducted on a discussion rather than a lecture basis.

Enrollment will be limited to 40, and applications for admission will be screened by the Stanford Graduate School to insure a diversity of representation by companies, industries, functions and geographic areas. Program has been designated particularly for men in the 35-50 age bracket who are exercising substantial responsibilities in their organizations.

Executives selected to attend the session will live in one of the university's dormitories and, as "Stanford students" will have full privileges to all recreation facilities.

GLASS PIPE vs. ACID PROBLEM



PROBLEM at Eitel-McCullough Inc. of San Bruno, Calif., manufacturer of electronic tubes, was to dispose of various acids used in cleaning tube parts. The answer was glass pipe. Part of system are traps under chemical sinks (pictured above) where acids may lie undisturbed for long periods of time without damaging pipe. For more about glass pipe, see article on pp. 35-37.

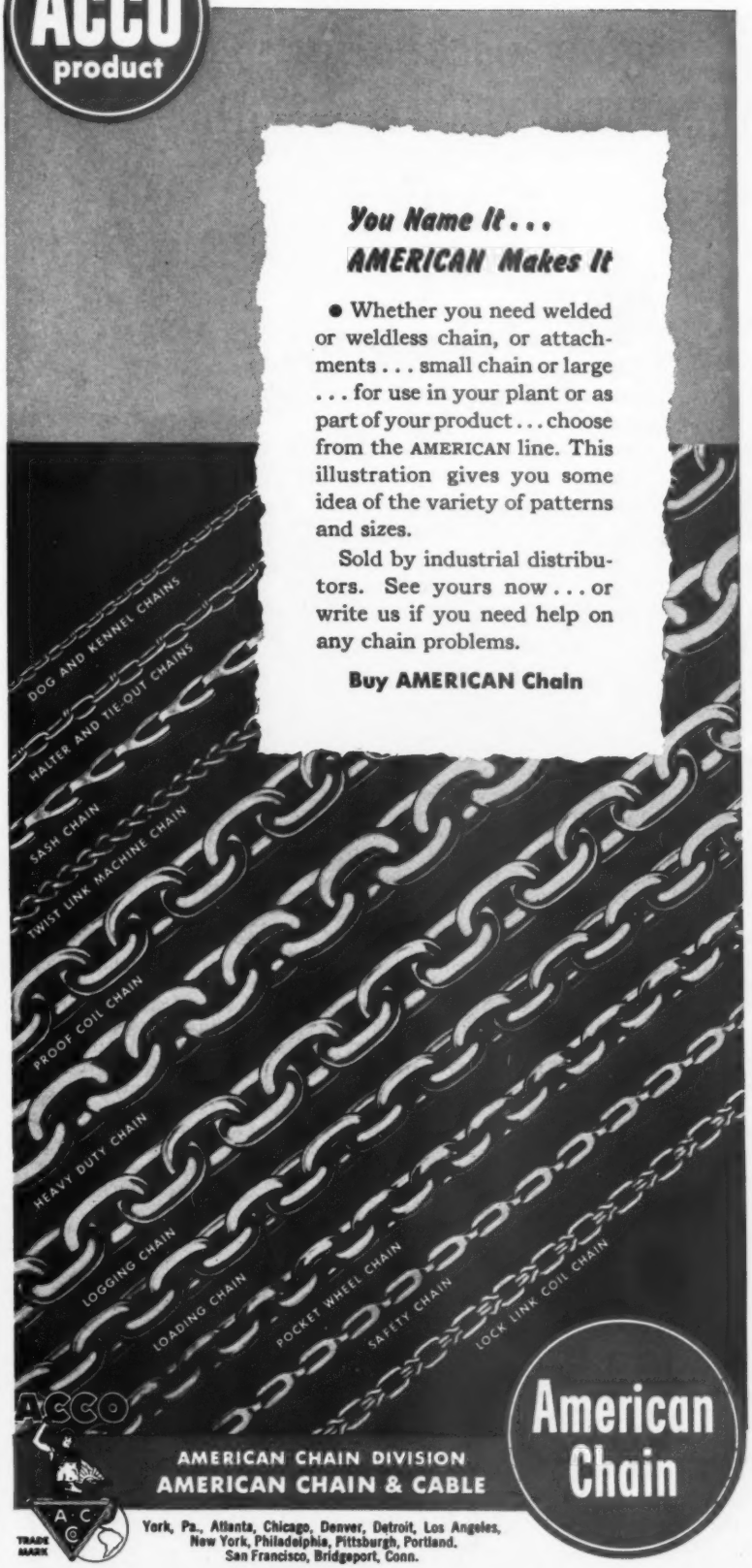
an ACCO product

You Name It . . .
AMERICAN Makes It

● Whether you need welded or weldless chain, or attachments . . . small chain or large . . . for use in your plant or as part of your product . . . choose from the AMERICAN line. This illustration gives you some idea of the variety of patterns and sizes.

Sold by industrial distributors. See yours now . . . or write us if you need help on any chain problems.

Buy AMERICAN Chain



ACCO

AMERICAN CHAIN DIVISION
AMERICAN CHAIN & CABLE

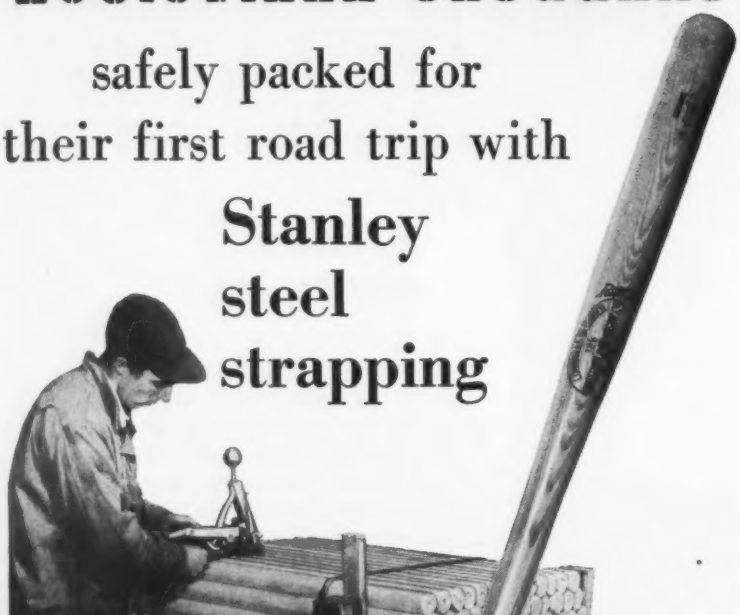
TRADE MARK

York, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Bridgeport, Conn.

American Chain

"LOUISVILLE SLUGGERS"

safely packed for their first road trip with Stanley steel strapping



Here you see bundles of round billets of select northern white ash ready for shipment to the Hillerich & Bradsby Company where they'll be made into world-famous "Louisville Sluggers".

To the shipper, The Norton Wood Products Co. of Tidioute, Penn., it was important that these baseball bats-to-be arrived at their destination undamaged. They solved this problem by calling in a Stanley Steel Strapping Representative, and with his help developed the bundle pictured here that proved successful in hundreds of subsequent shipments.

And this is just another example of how the Stanley Steel Strapping System and modern shipping methods save man-hours — materials — money — shipping almost any product.

The complete System includes tools, reels, seals, strapping — everything needed for your application. The Stanley Works, Steel Strapping Div., New Britain, Conn. Branch Offices or Representatives in 32 principal cities.

San Francisco Office • 527 Folsom St.
Seattle Office 618 2nd Ave.
Los Angeles Office 108 W. 6th St.

STEEL STRAPPING AND CAR BANDING SYSTEMS

STANLEY

Reg. U. S. Pat. Off.

HARDWARE • TOOLS
ELECTRIC TOOLS
STEEL STRAPPING • STEEL

Invite the Stanley Man to call

The Stanley Works, Steel Strapping Division
215 Lake St., New Britain, Conn.

Please ask your Representative to call and explain the advantages of the Stanley Steel Strapping System to me.

Name .....

Firm Name .....

Street .....

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BOOKS FOR INDUSTRY

Textbook on Band Machining Published by DoAll

A new 160-page "Band Tool Manual" published by *The DoAll Co.*, gives machine operators, students and production planning engineers a comprehensive explanation of all band tools used in sawing, slicing, filing, grinding and polishing operations. Photos and drawings are used throughout to define band tool terminology, the 16 kinds of band tools, and their application to the machining of material on band machines. A series of 82 band tool selection charts, arranged alphabetically according to kind of material, are contained in the manual. Charts give recommended band machining factors for optimum cutting rate, tool life and finish, according to thickness of material. Factors cover selection of kind of band tool to be used, its speed, pitch, feed, coolant and other related factors to be employed for efficient band tool operations. Price is $2.00 per copy.

Engineers Thesaurus Offers Vast Wealth of Information

Over 8,000 illustrations of machine elements and assembled machinery for engineers, designers, draftsmen and manufacturers are contained in The Engineer's Illustrated Thesaurus, written by Herbert Herkimer and published by *Chemical Publishing Co., Inc.* In this 572-page publication, which sells for $6.00 per copy, every conceivable type of machine element is clearly reproduced and identified. Where it is necessary, an explanation of the method by which it accomplishes its particular function is given. Simple and logical system of book will enable engineer to find information needed in shortest possible time.

Spokane's Wholesale Market Outlined in New Book

State College of Washington Press publishes a detailed analysis of the Spokane wholesale market which should prove a useful and informative guide for manufacturers and wholesalers serving or planning operations in the Pacific Northwest. This 201-page book by Rayburn D. Tousley, professor of marketing and chairman of the Department of Business Administration, and Robert F. Lanzillotti, assistant professor of economics, at State College of Washington, has as its

purpose to provide basic information about this particular market, and to add to the sparse literature on wholesaling a more comprehensive case study of a specific Western wholesale market.

Source material for this analysis consists of hitherto unpublished Census tabulations for quantitative data about the market, and of the authors' own extensive field investigations for qualitative information. Nineteen different product lines are treated individually, with supplementary information for nine additional lines. Price is $3.50.

Basic Information on Carbon and Alloy Steel

A 144-page book entitled "Tensile and Hardness Properties of Carbon and Alloy Steel," is published by *Heppenstall Co.* This publication discusses specific effects of various alloying elements in steel and briefly explains the manner of development of the tensile properties in a steel. Also included is a glossary of selected iron and steel terms and a number of helpful tables. Price of book is $3.00. However, for a limited time, copies will be sent without charge to steel engineers, metallurgists, purchasing agents, technical schools, libraries, engineering students and other individuals and organizations interested in the properties of steel, on written request.

Modern Arc Welding Thoroughly Discussed

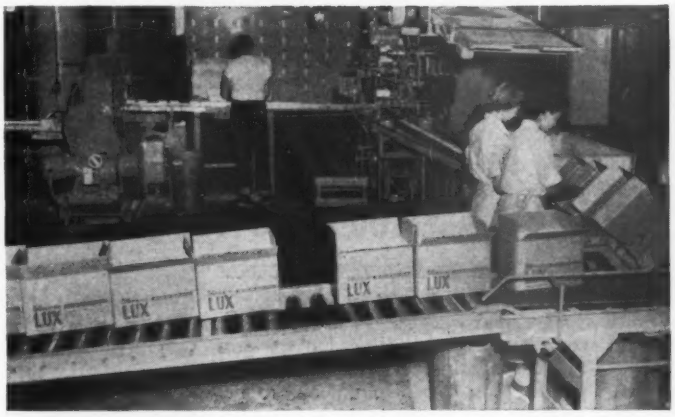
Of value not only to students but also to the practicing engineers, welding operators and designers is a 544-page book, "Modern Arc Welding," published by *The Hobart Trade School.* This literature, which contains over 600 photographs, diagrams and charts, costs $3.00 per copy. It constitutes a complete self study course, incorporating review summaries, practical exercises, and "quiz" questions, in addition to describing in detail the principles and practical operations of carbon arc welding inert-gas-shielded arc welding, submerged arc welding, and electric stud welding.

Albuquerque Wage Survey

"Occupational Wage Survey of the Albuquerque Area" is published by *Bureau of Business Research, University of New Mexico.* This publication, which sells for $.50, contains the results of a study of wages and hours prevailing during November 1951 in 28 manual, craft and clerical occupations in Albuquerque.

made RIGHT in the west

. . . to serve the west



● Here's the best source of supply for conveyers and conveyer systems . . . and it's right in your own back yard. A really modern western plant where conveyers are designed and manufactured to serve only western industry.

. . . and here's the best source of supply for information . . . to help you on your materials-handling problems as they come up . . . and with no costly delays. Just call your nearest Mathews representative. He is a trained conveyer engineer with years of experience in mechanized handling.

MATHEWS CONVEYER COMPANY WEST COAST

SAN CARLOS, CALIFORNIA

Engineering Offices and Sales Agencies in Principal Western Cities

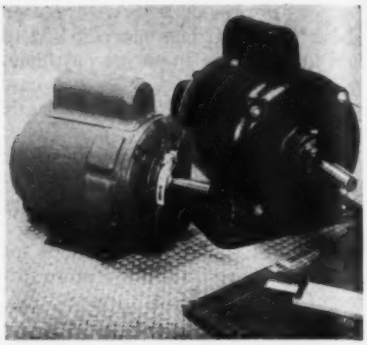
New Design by G.E. for Fractional Horsepower Electric Motors

AUTOMOBILES, railroad locomotives, typewriters and many other products—even including pens and pencils—undergo a face-lifting process now and then, either to increase their eye-appeal, their function, or their marketability. Now they've gone and done it to the workhorse of the workshop—the fractional horsepower electric motor.

General Electric engineers have come up with a new line of smaller, lighter, and more versatile motors, designated at "Form G."

A new line of fractional horsepower motors embodying an entirely new concept of motor design and manufacture has been announced by the General Electric Company's Fractional Horsepower Motor Department.

Designated as "Form G," the new motors are the result of nearly a decade of developmental engineering and research, and incorporate many radically different and advanced design features.



COMPARISON of one of G.E.'s new totally-enclosed fan-cooled Form G motors (left) with its predecessor of equivalent rating. Considerably smaller in size, and neater, the new motor weighs less than half as much as motors that it replaces.

According to G-E engineers who worked on the project, the Form G motor weighs as much as 51 per cent less per horsepower than the models it replaces, and is considerably smaller in size. At the same time, its versatility of application has been broadened and its appearance modernized.

The motors are available in open dripproof and totally enclosed fan-cooled models in Types K (polyphase), KC (capacitor start), KH (split phase), and KCP (permanent split capacitor).

They have hundreds of applications—on pumps, fans, blowers, compressors, office and home appliances, motorized tools of all sorts, etc. Design principles ultimately will be adapted to motors for more specialized uses as the Form G line expands.

These motors incorporate a completely new insulation system developed by G-E especially for this project. It consists of a special nylon material scientifically combined with Formex wire and Glyptal varnish to give the motors longer life.

Being smaller and lighter, the Form G permits installation of maximum power in minimum space. Its use also decreases transportation and storage costs on motors and motorized devices, makes handling easier in factories and warehouses, and eliminates the need for heavy mounts on machines.

Open dripproof models are as much as 48 per cent lighter than previous motors of equivalent rating, while the totally enclosed fan-cooled types weigh less than half as much in some cases.

With the improved bearings, lubrication, and insulation, the Form G general purpose sleeve-bearing motor offers a wider range of application, and will eliminate, in many instances, the extra expense of special enclosures or

WHAT
Magic Carpet
ARE YOU USING . .
to reduce the cost of moving your product to the user . . . ?
Less tare weight . . . lower freight cost . . . easier handling and stacking . . . lower container cost . . . reduced packing cost . . . minimum product damage . . .
These are thoughts worth conjuring with! Some, or all, of these advantages may reasonably be expected when you change over your present shipping crate to a Martin Wirebound . . . ingeniously tailored to your own product and problems. Write us—we will send a Martinman to discuss them.
PLANTS & OFFICES: Whittier, Calif.; San Jose, Calif.; Oakland, Oregon; Seattle, Wash.; Toledo, Ohio.
Container perfection means Product protection
the MARTIN BROTHERS Box Co.
11655 EAST WASHINGTON BLVD.
WHITTIER, CALIFORNIA

ball bearings. It is the only motor of its type recommended for all-angle operation.

Form G conforms fully to all NEMA specifications. These motors will be offered in a complete range of standard horsepowers, speeds, voltages, and frequencies.

Synthetic Wood Now Used In Papermakers' Felts

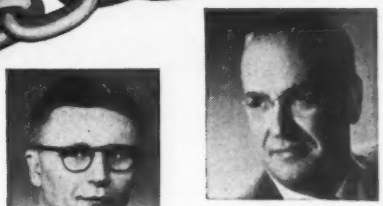
FELT made of synthetic fibers instead of wood is now being used in papermakers' felts. This synthetic felt, which was developed by F. C. Huyck & Sons, is now in use at Crown-Zellerbach Corp.'s Camas, Washington, mill.

Papermakers' felts are wide continuous belts which carry pulp during its gradual conversion into paper. Until recently these felts have been made of wool, because it has special characteristics needed in this type of operation.

According to Greenville R. Holden, president of F. C. Huyck, all-synthetic felt runs considerably longer than wool felt and is also outstanding in its performance for water removal, free running qualities and resistance to frictional wear.

Industrial Sales Manual

"Selling to Industry," written by Bernard Lester, and published by *The Industrial Press*, is a pocket-size book written as a manual of practical ideas and suggestions for sales engineers who want to analyze and improve their methods of finding, contacting, selling and servicing industrial customers. Book, which sells for $3.50, is arranged in the form of short easy-to-read articles, some of which have appeared in *Machinery* in somewhat briefer form. Reprints of many were used effectively by several industrial concerns in the metal-working field.



WILLIAM J. McELROY
President and General Manager

BYRON M. GLAD
Portland Manager

GERALD T. KNOTT
Asst. General Manager

ROUND SEATTLE CHAIN CORP.

For nearly forty years, Round Seattle Chain has been growing with the great Pacific Northwest. This important plant not only manufactures and distributes heavy chain for the lumber, fishing and marine industries, but *all types* of welded and weldless chain, chain hoists, electric hoists, trolleys, winches, etc.

ONE OF THE COMPANIES THAT MAKE

Round CHAIN

The coast-to-coast Round organization is justly proud of Seattle Chain and of the men who manage it. In all parts of the United States, other Round Chain Companies are equally well qualified to supply *a complete line of chain* in their respective territories. Wherever you are, there's a Round Chain Company nearby *to serve you better.*

Welded and Weldless Chain for Every Need!

SLING CHAINS • LOG CHAINS • HOIST CHAINS
HOISTS • HOOKS • FITTINGS AND ATTACHMENTS

ORDER FROM YOUR DISTRIBUTOR, OR CONTACT ONE OF THE

Round CHAIN COMPANIES

HELPFUL LITERATURE

for the plant operator who wants to keep informed

401

A digest of 54 factory cleaning and maintenance jobs

Revised edition of "Oakite Plant Maintenance Digest," reviewing materials and methods for performing 54 maintenance cleaning and related tasks in factories and mills, is available to you by courtesy of *Oakite Products, Inc.* Contained in this brochure are suggestions for determining the most efficient methods and materials for each of the 54 cleaning jobs discussed. Among the operations covered are the following: air conditioning equipment maintenance; cleaning-descaling heat exchangers; cleaning lathes, drill presses, machine tools; electrical department cleaning; reconditioning gas welding and flame cutting tips; cleaning and stripping motor housings; cleaning conveyor belts; filter cleaning; floor maintenance; oil, grease and dirt removal from large equipment; derusting metal parts; preventing rust in hydraulic systems; stripping paint from metal; paint spray booth maintenance; steam-detergent cleaning, and many others.

402

These case histories will help solve your production problems

"Air Power at Work," published by *Mead Specialties Co.*, is a collection of case histories on 39 different production problems and their solution by use of semi-automatic or automatic combinations of various air-operated devices for the job to be done. Each different combination of work feeders, air presses, timer valves, etc., is clearly pictured by photographs, and descriptions of specific operational methods. These case histories can be inspiring examples for plants interested in feeding large quantities of small parts to working machines.

403

Here's authoritative data on welding of steel castings

Steel Founders' Society of America has compiled a report on recommended practices for welding steel castings which should prove a handy reference manual for engineers, technicians and others concerned with this field. This 40-page booklet contains the following sections: welding methods, electrodes and recommended welding procedure for carbon-steel and low-alloy steel castings. Usual price for publication is 35 cents, but *Tempil® Corp.* will supply complimentary copies to engineers and technicians upon letterhead request.

404

Suggestions for making the most of your engineering manpower

A survey report entitled, "How to Improve Engineering-Management Communications" is first in a series of executive research projects, undertaken by *National Society of Professional Engineers* to help alleviate the current shortage of engineers by assisting industry in securing best utilization of its present engineering force. Report includes surveys of general management and top engineering executives on current practices in engineering-management relations and pooling of up-to-date experience for benefit of industry and the engineering profession. Survey upon which report is based was nationwide, carried on by means of questionnaires, personal inquiry and consultation. Over 80% of all answers were obtained from company top management. Put key number on coupon to order your free copy.

405

A wealth of information about minerals of the Southwest

Mining Committee of the Los Angeles County Chamber of Commerce has issued a new edition of its comprehensive data book on all aspects of the mineral industry of California and the Western states. Special emphasis has been placed on economic aspects of minerals. Information for aiding prospectors and miners to dispose of their products is also stressed. This information is also of importance to the chemical, mining, mining equipment and other industrial plants in the West. Book is divided into three main sections. One part is devoted to industrial minerals, and it lists sources, uses and characteristics of these materials. Another part lists metallic ores, giving properties, sources, applications and marketing information. Last section contains aid to miners on all aspects of the industry.

406

Electrical data book for architects and engineers

Westinghouse Electric Corp. has for you a new 330-page, revised edition of its architect and engineers electrical data book, which includes information on new equipment and new methods of using this equipment as well as an entire new section on power distribution. Book is so designed so that detailed information on almost any type of electrical equipment is readily accessible. It is divided into three general equipment categories: power plant, electrical distibution, and utilization and accessory equipment. Each piece of apparatus contained in equipment categories is thoroughly described with illustrations, charts and technical data. Application, features, selection, dimensions and specifications of all equipment are given. Engineering data section deals mainly with product application and design of distribution systems.

407

A catalog of "long wearing machinery parts"

A wide variety of cast and wrought alloy parts now being used in many industries to solve abrasion, corrosion and high-temperature problems is described in a 24-page booklet, "Long Wearing Machinery Parts," published by *Haynes Stellite Co., Division of Union Carbide and Carbon Corp.* More than 60 blueprints, tables and photographs show some of the sizes and shapes in which these alloy parts are being used. Parts described are made of various cobalt-, iron-, and nickel-base alloys which have had wide use as metal-cutting tools, jet aircraft parts, chemical equipment, and many types of valves and furnace parts.

408

Answering the question "What's a silicone?"

An unknown quantity can only be described in terms of what it does, and this is what prompted *Dow Corning Corp.* to write a 32-page booklet, entitled, "What's a Silicone?" Instead of a technical, analytical discussion of silicone composition this book shows how silicones are used. Among the types described are polishes, water repellents, fluids, release agents, lubricants, defoamers, silastic and protective coatings.

MORE LITERATURE, PAGE 79

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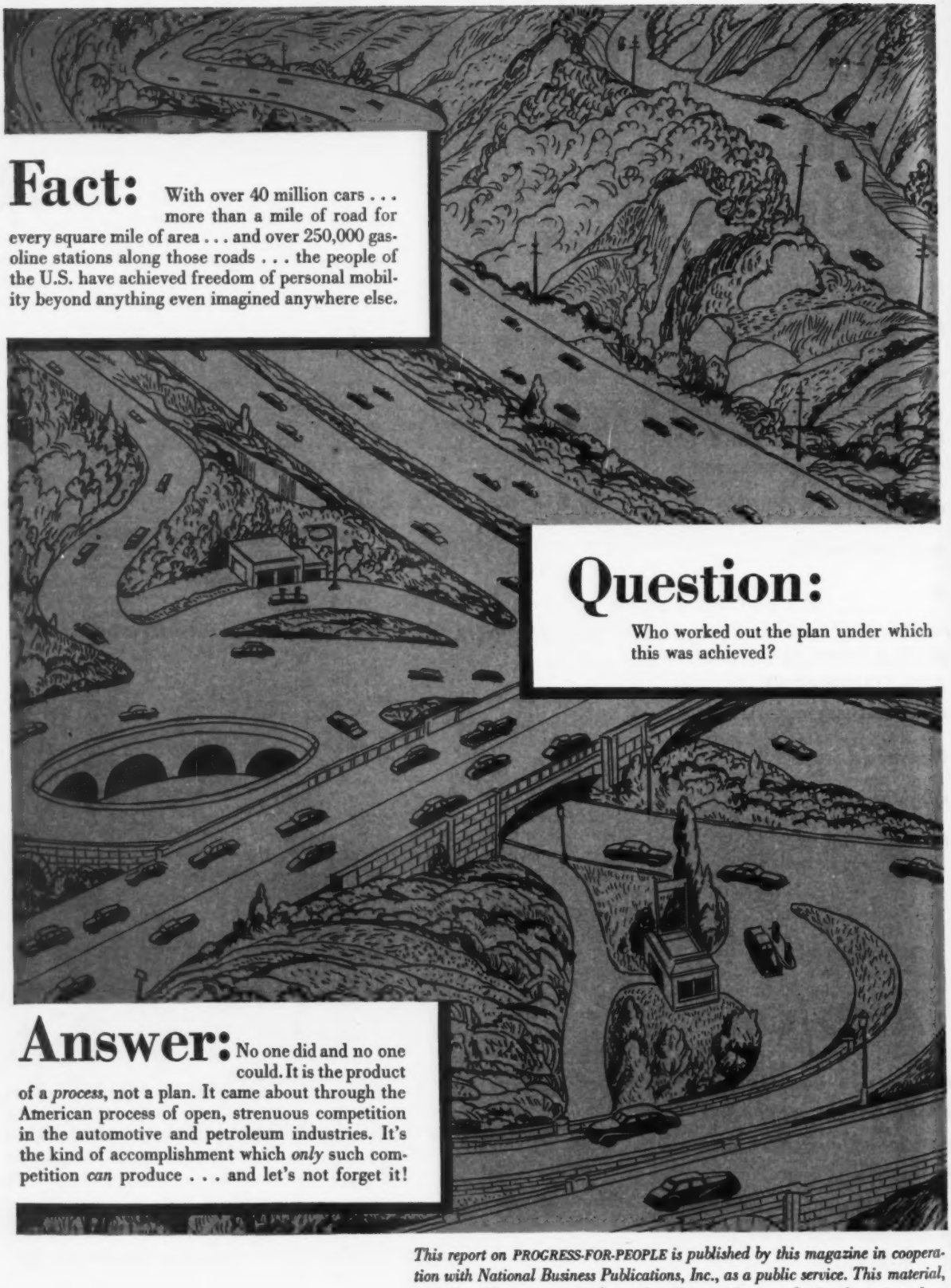
Fact: With over 40 million cars . . . more than a mile of road for every square mile of area . . . and over 250,000 gasoline stations along those roads . . . the people of the U.S. have achieved freedom of personal mobility beyond anything even imagined anywhere else.
Question:
Who worked out the plan under which this was achieved?
Answer: No one did and no one could. It is the product of a process, not a plan. It came about through the American process of open, strenuous competition in the automotive and petroleum industries. It's the kind of accomplishment which only such competition can produce . . . and let's not forget it!

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The competitive system delivers the most to the greatest number of people

409

Pocket-size manual on fluid power circuits

Logansport Machine Co. is making available a 32-page, pocket-size book which presents a discussion of basic designs in fluid power circuits, together with drawings and specifications. It is intended as a down-to-earth explanation of representative types of fluid power circuits for industry. This piece of literature shows the many possibilities available through use of different types of circuit designs.

410

Crusher catalog

Stephens-Adamson Manufacturing Co. releases a bulletin covering its complete line of crushers. Included are knittel ring-type crushers, both single and double rotor; single roll crushers; double roll crushers and two stage double-roll crushers. Catalog gives capacity and power requirements for all types of crushers reducing run-of-mine bituminous coal to various finished product sizes.

411

Pressure-filled metallic O-rings

UAP technical bulletin No. 21252, containing data on metallic O-rings manufactured in the United States under license agreement by *United Aircraft Products, Inc.*, is available from that company. These O-rings are hollow metal tubing rings filled with inert gas at 600 psi.

412

Oil and gas burning equipment brochures

Hopkins Volcanic Specialties, Inc., offers our readers two booklets on its line of oil and gas burning equipment. Complete specifications and descriptions are included.

413

How to stop paint overspray

Research Products Corp. publishes an 11-page, two-color bulletin on its line of paint arrestors. All data regarding size, price and packaging is listed.

414

Seamless metal hose catalog

Johnson Metal Hose, Inc., issues a two-color booklet on its line of flexible seamless metal hose, for use in conveying under pressure or vacuum steam, oil, water, gas and refrigerants.

415

Beckman instruments cataloged

Electro-metric equipment, spectrophotometers and other scientific instruments, manufactured by *Beckman Instruments, Inc.*, are highlighted in a 16-page catalog from that company. Special sections of the booklet are devoted to specific instruments such as automatic titrator, micro-microammeter, ultrohmeter, flow colorimeter, and radioactivity instruments.

416

Record retention and destruction

"A Basic Plan for Record Retention and Destruction" is title of a 24-page brochure just released by *Remington Rand Inc.*, to aid management in planning for disposition of records at time of their creation. This profusely illustrated handbook, with actual reproductions of various forms used for record retention and destruction, contains a checking chart listing various types of records and the time element for their retention.

417

Caster catalog

Descriptive literature on *Faultless Caster Corp.'s* line of industrial casters is now available from that company. Assuring level load on trucks moving over irregular floors is featured subject.

418

Yale electric trucks

Exclusive features of *Yale & Towne Manufacturing Co.'s* line of electric trucks is highlighted in the booklet, "The Yale Electric Truck," available from that manufacturer.

419

Fiberglas facts

To help you in solving your duct job problems, *Owens-Corning Fiberglas Corp.* has for you a booklet entitled "Industrial Fiberglas Installations" which is available upon request.

420

Regulator booklet

National Welding Equipment Co. has for you a booklet illustrating its stock of regulators, and telling how these instruments operate when they measure flow and perform similar functions.

421

Motor and generator brush chart

Tri-State Supply Corp. is offering our readers a motor and generator brush wall chart. For easy selection, brushes are pictured and arranged in groups showing styles with dimensions.

OBTAIN YOUR FREE COPIES of valuable reference booklets described above by using coupon on page 77. Write in key numbers for those you want.

422

How to keep lighting maintenance standards high

A 12-page, two-color bulletin, "The Why, When and How of Modern Lighting Maintenance" is obtainable from *Lighting Division of Sylvania Electric Products, Inc.* Literature emphasizes high cost of low lighting maintenance standards and stresses that planned maintenance of both light sources and reflecting surfaces saves costly time and useful light. Booklet also contains an 8-step program of planned fluorescent lighting maintenance suggestions.

423

Alcoa booklets

Knowledge on how to use aluminum and time to your best advantage is carefully outlined in four booklets by *Aluminum Co. of America.* They are: "Welding and Brazing", (130 pp.); "Aluminum and Its Alloys" (168 pp.); "Alcoa Aluminum in Automatic Screw Machines" (95 pp.), and "Riveting Alcoa Aluminum" (56 pp.).

424

On electric power drives

All types of electric motors produced by *Sterling Electric Motors, Inc.*, are outlined and illustrated in a handsome booklet available from that company. Complete specifications as well as application information is given.

425

Materials handling equipment

Bunn tying machines, steel shop equipment, casters, hand trucks, hoists and cranes, semi-live skids, dollies, platforms, steel boxes, lift trucks, power trucks, overhead conveyors and other items carried by *Geo. M. Prescott Co.* are illustrated in a new two-color catalog issued by Prescott.

426

For mine and tunnel ventilation

A flexible, lightweight, reinforced fabric duct, designed for mine and tunnel ventilation called Spiraltube-M, and a heavy-duty pressure tube without wire frame, called Ayrtube, both manufactured by *Flexible Tubing Corp.*, are described in a booklet available from that firm.

427

Hydraulic truck-crane news

Available from *Edward R. Bacon Co.* is new booklet on line of Hydralift truck cranes manufactured by *Pitman Manufacturing Co.* Specifications for all models included.

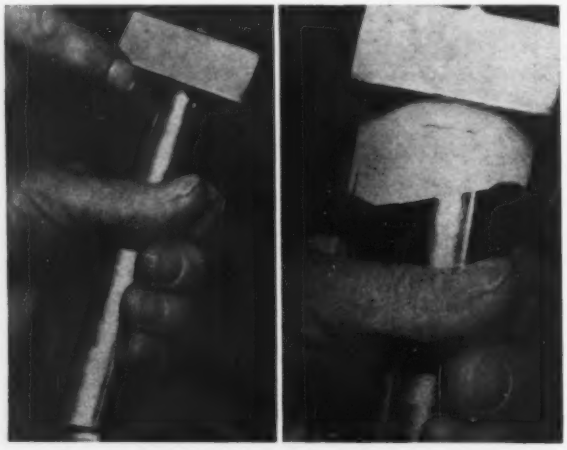
NEW MATERIALS & EQUIPMENT

COUPON ON PAGE 77 provides an easy way to obtain more information on products introduced.

428

For quick detection of surface flaws

Met-L-Chek is a penetrant dye inspection process which detects cracks, pores and cold shuts in all types of metal parts. It is applicable to both ferrous and non-ferrous parts, ceramics, glass and thermosetting plastics. Mass visual inspection under normal shop conditions is adequate for

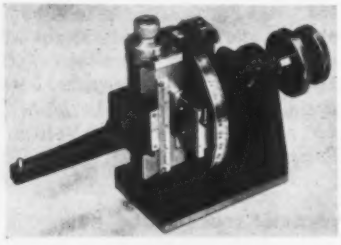


detection. Process consists of only two solutions—dye and developer. Parts are dipped in red dye solution which penetrates any cracks or pores within three minutes. Surface dye is then washed away with water. Surface tension of water prevents it from penetrating microscopic cracks; therefore, only dye in crack remains. Parts are next dipped in white developer solution. This dries quickly, leaving a white coating which sucks the dye out of cracks similar to the way in which a blotter sucks up ink. Dye spreads out through blotting action leaving a vivid red stain many times wider than the flaw, and therefore visible to the naked eye. Manufacturer is *Met-L-Chek Co.*

429

Precision dresser with built-in micrometer

Set-up time is reduced to one-fourth the time usually required by experienced tool makers with this precision dresser for all angle-tangent-to-radius grinding wheel forms. It eliminates Jo blocks, height gauges, micrometers and other precision instruments. A built-in micrometer provides direct reading, rapid adjustments and accuracy down to "tenths." Setting for required angles is provided by a vernier scale graduated in minutes. Two stop dogs control desired arc. It dresses concave radii as small as .032 in., full 180 deg., using small radius attachment furnished. This unit, called the Tangi-Matic, dresses from bottom of wheel where grinding actually takes place. This permits operator to control wheel accurately by using grinder draw feed. Manufactured by *The Perfex Gage and Tool Co.*



430

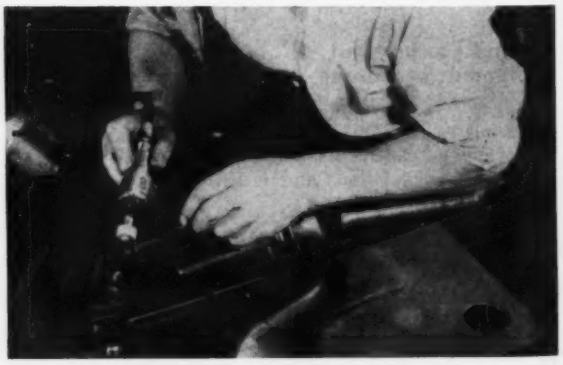
Portable hand calculator

This "Curta" portable hand calculator, made by Swiss precision watchmakers, will add, subtract, multiply, divide, figure square roots, factors, cubes and percentages. It is as easy to operate as a slide rule. It carries to five decimal places and totals to 99,000,000,000. Figures can be checked and re-checked on three sets of dials. Although it weighs only 8 oz., this machine, manufactured by *Curta Calculator Co.*, will do as much as electric desk calculators which cost a great deal more.

431

Pneumatic grinder small, easy to handle

This "shorty" pneumatic grinder, with precision parts, is especially designed by *Mall Tool Co.* for machinists, die makers, aircraft manufacturers, plastic industries and similar applications. It has a comfortable hand fit, an exhaust that directs air away from operator toward wheel to cool



and clean work, chuck guard, and a noise silencer that eliminates high pitch tones present in most air tools. Grinder can be used with such accessories as mandril-mounted abrasive wheels and points, rotary files, carbide burrs, wire brushes, cartridge-wound coated abrasive rolls, sanding and polishing discs, shaping and finishing attachments for dies, molds, castings, forgings, patterns. It is equipped with Erickson precision collets, and has a maximum .0015 arbor runout to insure finest accuracy. Weight is 19 oz., and overall length is 5¼ in.

432

Tote pan made of reinforced fiberglas

This tote pan has greater resilient strength than steel, is lighter than aluminum and is impervious to water, oil and most chemicals. Weight of tote pan is 4½ lb. It is fiberglas

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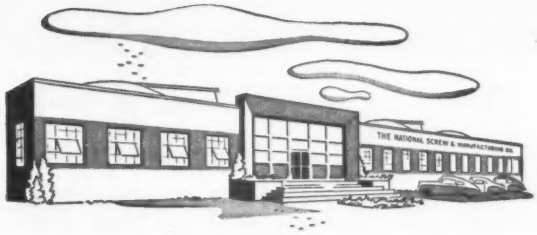

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★ RIDGID design 3-jaw chuck, chuck wrench ejector; self-centering workholder in rear turns with pipe.

★ Sealed-in lubrication—no oil to spill.

★ See the remarkable "400" at your Supply House!

THE RIDGE TOOL COMPANY • ELYRIA, OHIO

RIDGID
Work-Saver Pipe Tools

reinforced so that it can stand more than ordinary abuse. A variety of surface-smooth molded-in colors are available. Freezing or cleaning with steam will not affect color. Appearance is attractive and would be as acceptable in a food processing plant as in a machine shop. Manufacturer is *The G. B. Lewis Co.*

433

For quick, low-cost compression tests

Accurate compression and crushing tests can be made quickly and easily with a low-cost, lightweight, portable hydraulic compression machine available from *Labquip Corp.* In this machine, load is applied to test specimen through a hydraulic system actuated by compressed air. Load applied to specimen is indicated on dial of a double proving ring. Ring is used to obtain greater accuracy in low range in tests which involve large loads and to eliminate necessity of changing rings for different tests. Load applied to specimen is indicated on double proving ring dial. Complete stress-strain data may be obtained by reading this dial and specimen strain dial at intervals during test. An important feature of this machine is its ability to release load instantaneously at any time during test or at point of failure and thus keep specimen intact for measurements of photographs.

434

Cylindrical grinder for small parts

For fast, accurate grinding of small cylindrical parts, *Norton Co.* has developed a cylindrical grinder which is available as a plain machine or as a semi-automatic in work length capacities of either 12 or 18 in. Wheel feeds and job set-ups are simplified by a graduated, wheel-feed handwheel. Graduations indicate amount of feed as handwheel is rotated past fixed pointer. A "click-count" indexing mechanism on handwheel provides advantage of making fine feed settings by feel rather than by setting an index pin in a target. This mechanism clicks a detent on rotation of its control knob, each "click" representing a setting for .0001 in. work diameter reduction. Grinding and truing table speeds are independently adjustable, and are quickly obtained by positioning table start-stop lever. No resetting of speeds is necessary when changing from one speed to another. Automatic or manual control of work rotation and coolant flow is also provided. A selector switch gives type desired. Automatic adjustable wheel feed at table reversals with automatic reset of wheel head, and separate dwell controls for each end of table travel are features that permit traverse grinding with a minimum of effort. Operation is further eased by convenient positioning of all controls for speeds and feeds in operating area.

Use coupon, page 77, for more information

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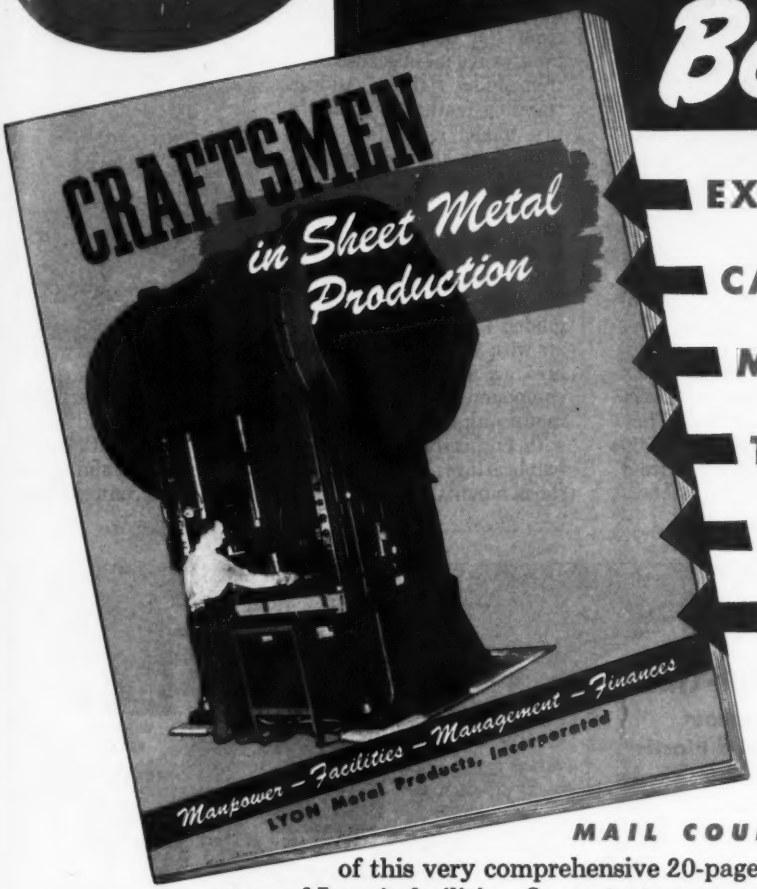

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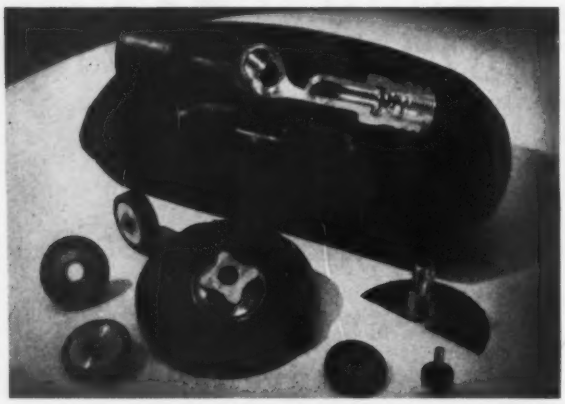
• Bin Units	• Drawing Tables	• Parts Cases	• Wood Working Benches	• Hanging Cabinets	• Bench Drawers	• Hopper Bins	• Shop Desks

435

Molded rubber shapes bonded to metal components

These highly specialized or custom-fabricated parts, consisting of molded rubber shapes bonded to any ferrous or nonferrous metal component or ceramic compositions come in a wide variety of sizes and shapes and can be produced

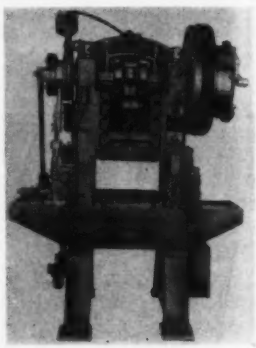


for application in processing equipment of all types, control valves, electric control devices, conveyors, heat treating equipment, electrical switches, contacts, and controllers. They are fabricated by *The Andrews-Alderfer Co.* from natural or reclaimed rubber stocks and from such synthetics as Buna S, Buna N. Neoprene, Butyl, and Thiokol. They can be supplied having tensile strengths ranging from 500 to 3,500 lb. per sq. in. Durometer hardness can range from 30 to 100 and elongation from 50% to 900%. Rubber-bonded-to-metal parts can be furnished which will remain stable upon exposure to temperatures ranging from —75 to 200 deg. F. Special stocks featuring maximum resistance to abrasion, weathering and various chemicals can be utilized in the production of parts requiring these properties.

436

Precision tamping press is safe, speedy

"Diebel Di-Matic" press, available from *Di Machine Corp.*, is designed to meet most modern press requirements for both accuracy of alignment and speed in operation in precision tamping. It produces intricate piece parts from the most complicated progressive dies because of its tremendous rigidity. An outstanding feature of this safe, fast model is its four main crankshaft bronze bearings. It also has an air-operated and electrically controlled friction clutch and brake; air ejector and cam; metered lubricating system; cylindrical slide 16 in. in diameter guided by adjustable retainers with 380 sq. in. of contact area; a knock-out bar for compound dies, built-in scrapcutter; 5 hp. vari-drive motor; air-clamped roll feed, driven by rack and pinion with Formsprag overrunning clutch equipped with double ball bearings; and an especially designed spring and rubber shock mounts. Provision is made in electrical control circuit



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Here is just another example of the versatility inherent in Formed Plastic parts developed for the specialized needs of industry after industry by Blackman.

Blackman offers you complete production facilities, from design through final assembly, of parts made from plastic sheet materials . . . *Royalite, Laminated Phenolics, Lucite-Plexiglas and Vulcanized Fiber.*

For low-cost tooling . . . for elimination of costly finishing operations . . . for speedy development and delivery of prototypes and pilot runs . . . bank on Blackman. *Write or phone today for quotations or discussion of your problem.*

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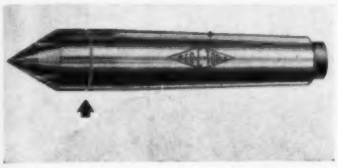
for use of safety shut-off device, giving maximum protection for press and die.

437

Carbide-tipped center has grinding safety line

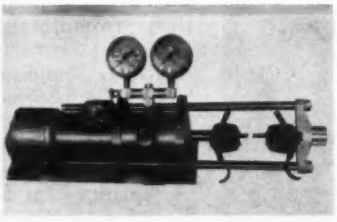
In order to eliminate costly replacements of carbide tipped centers that are ground too closely, *Ready Tool Co.* has added a "life line" to its line of centers which indicates maximum amount that center can be ground and acts as a warning to operator when regrinding. Center groove is accurately machined and painted bright red so that operator will constantly have a guiding line by which he can tell when his grind has gone far enough for safety. Center carbide insert is made of fine sintered tungsten carbide by the "hot pressed" method, providing longer life from abrasive wear. Available in all Morse, Brown and Sharpe, Jarno, Hendy, ASA, Norton and Reed tapers and sizes.



438

Hydraulic tensile tester with ram pulling action

A hydraulic portable tensile tester, available from *Cal-Testing Machine Co.*, has pulling action taken directly from ram rather than from push-pull construction through a crosshead: thus, friction from lateral pressure is eliminated. Moving grip is suspended from center of piston, further assuring a frictionless, true axial pull. Both grips are self-aligning. Piston and cylinder are ground and of a packless type. There are no pressure seals used. Cylinder room is also used for a reservoir, eliminating unnecessary weight and space. Both wedge type grips can be operated at the same time with one hand while specimen is inserted with other hand.



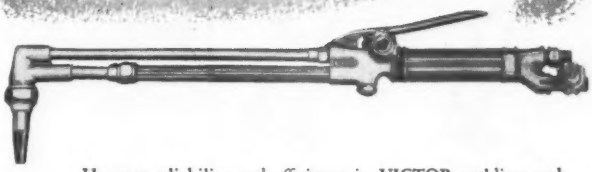
439

Super-speed air attachment for your spot welder

An air attachment which can be installed on your manually operated spot welder will provide you with the following advantages: 100 to 300 spots per minute operating range; consistent weld timing; quiet operation and low maintenance cost. Installation is quick and easy: It involves blocking upper arm in a position parallel to lower arm; clamping air head assembly to upper arm; bolting air accessory unit to welder frame; mounting control on or near welder and providing inter-connecting wiring. This complete unit, available from *Call Equipment Co.*, consists of the following items: an air head assembly consisting of cylinder, ejector type electrode holder, flexible lead, solenoid operated air valve and clamping fixture; control unit, consisting of a motor driven cam assembly with solenoid operated clutch and micro-switch control of cylinder action and weld timing; air accessory unit including pressure regulator with gauge, lubricator and hose for connecting to solenoid valve; electric foot switch; and magnetic contractor.

the man on the job..

Wants VICTOR Reliability



He gets reliability and efficiency in VICTOR welding and cutting torches, and regulators because they're built right.

Precision machining assures leak-proof joints and ease of maintenance. Four head angles—90°, 75°, 45° or straight—and 4 lever positions—top or bottom and forward or rear of handle—enable you to choose the torch that exactly fits the job in hand.

VICTOR's complete range of tips, in sizes 000 through 16, are designed to give maximum cutting speed and gas savings on any job from light sheet to heavy plate cutting.

See for yourself why it costs less to own and operate VICTOR. Ask your VICTOR dealer for an on-the-job demonstration *TODAY*.

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adjusts to various heights and diameters from 1¼" to 28".

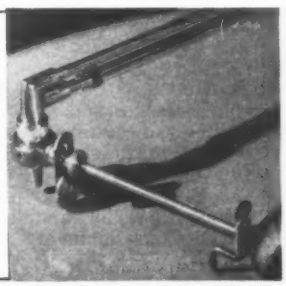

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FIG. 1402 Heavy duty bar handle platform truck

FIG. 1501-X "Auto-Load" Barrel Truck

FIG. 1152 DPL Light weight 2-wheel utility truck

FIG. 1011 Balance-type platform stake truck

FIG. 18 Western Pattern with Steam Bent Handles

FIG. 215 Golden Gate Pattern

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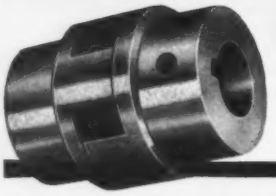
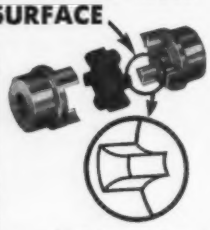
NOT JUST ANOTHER COUPLING



GERBING'S Exclusive CONCAVE JAW SURFACE



The concave jaw surface of the new Gerbing Flexible Coupling actually holds the resilient synthetic rubber insert or spider in position, thus eliminating any tendency of the rubber to break or extrude. Capable of handling peak loads, shocks and overloads. Instantly compensates for angular and parallel misalignment.

Available for shafts ½" to 1⅞" and H.P. ranges from fractional to 25. Standard keyways are provided. A long-lasting vibration-free drive for a wide range of applications. Deliveries from stock.

Write for details

. . . holds spider in position at all times —No extruding!

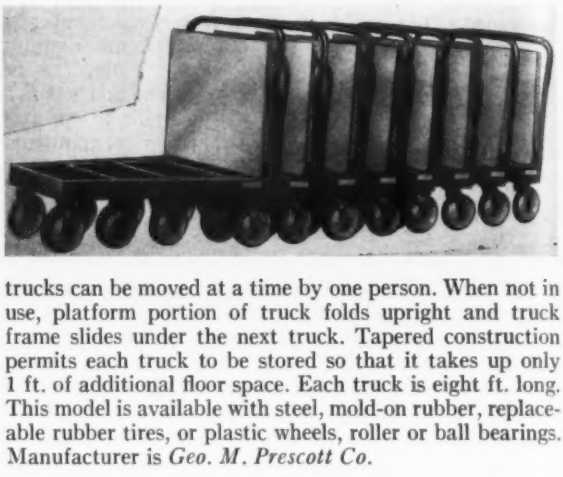
- NO BREAKING OF SPIDER
- CLOSE CONCENTRICITIES ASSURE VIBRATION-FREE OPERATION

GERBING MANUFACTURING CORP.
WEST COAST—2721 S. MAIN, LOS ANGELES 7, CALIF.

440

Conserve your floor space with this platform truck

Here is a platform truck that, when not in use, can be stored to save about 70% of space ordinarily required. Yet, it is instantly available when needed. A number of these



trucks can be moved at a time by one person. When not in use, platform portion of truck folds upright and truck frame slides under the next truck. Tapered construction permits each truck to be stored so that it takes up only 1 ft. of additional floor space. Each truck is eight ft. long. This model is available with steel, mold-on rubber, replaceable rubber tires, or plastic wheels, roller or ball bearings. Manufacturer is *Geo. M. Prescott Co.*

441

Thread ring gauge, no "wear allowance" needed

For the inspector, this thread ring gauge is made of a combination of titanium and carbide. Ring gauges are light in weight and show phenomenal wear life. Completely eliminated is the need for building "wear allowance" into gauge. They are manufactured to such a high degree of accuracy that a special wear check plug is provided with each ring. This special plug is a double end type with one end slightly larger than the other to detect any possible wear. *The Pipe Machinery Co.* can supply your needs.

442

High purity welding rods for aluminum

Two high purity welding rods, produced by *All State Welding Alloys Co., Inc.,* are especially suited to welding aluminum by various methods of arc welding (including inert gas) and by oxy-acetylene methods. These rods are equally applicable with AC or DC electric welding equipment and oxy-acetylene welding equipment. They have high ratings in weldability, smooth finish, speed of application and uniform results, due to close process control combined with advanced methods of manufacture. Unusual cleanliness is due to extrusion manufacture to exact diameter required. Drawing and the possibility of minute surface inclusions of the drawing compound are completely eliminated. These rods are designed for all work requiring 43S or 2S aluminum wire applied with inert gas, normal arc or torch. Standard diameters include 1/16, 3/32, ⅛, 3/16 and ¼ in. Standard length is 36 in., and standard

Use coupon, page 77, for more information

package is 50 lb. Both rods are also packaged in coil form. Both the 43S and 2S alloys are available as drawn wire.

443

Resilient packing material

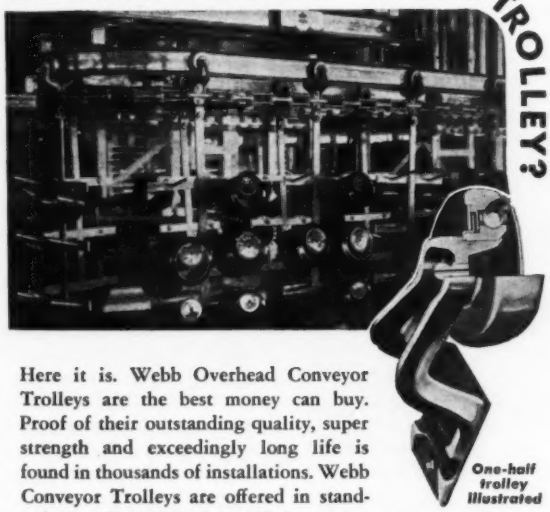
Celluliner, manufactured by *The Gilman Brothers Co.*, is a protective wrapping material for anything that has to be packed to take jars and jolts. It has four times the resilience of conventional packing materials. It can be made highly absorbent, or non-absorbent and moistureproof, mildew-proofed and flame-proofed. It is chemically neutral and cannot tarnish, corrode or otherwise chemically alter any material or product. It has amazing insulating qualities: When a one-inch thick square of flame-proofed Celluliner is attached with an oxy-acetylene torch, it does not even get warm. Product is available in any number of outer coverings such as paper, tissue, cloth or plastic.

444

Pressure-filled metallic O-rings give static, positive seal

A new type of permanent, easily installed metallic O-rings, developed in England by *Wills Ring Co.*, gives a positive metal to metal static seal wherever problems of heat, pressure, corrosive liquids or gases are involved. These O-rings are hollow metal tubing rings filled with inert gas at 600 psi. They are dimensionally stable under heat or cold, are not affected by age, and are impervious to oils, gases or aromatic mixtures. They can be installed in present ring grooves, in free machined recesses, or with a special compression limiting device which can be incorporated in rings. They can also be installed without grooves or recesses. They will hold against pressures as high as 20,000 psi., and withstand temperatures limited only by the

LOOKING FOR A BETTER TROLLEY?



Here it is. Webb Overhead Conveyor Trolleys are the best money can buy. Proof of their outstanding quality, super strength and exceedingly long life is found in thousands of installations. Webb Conveyor Trolleys are offered in standard sizes for original installation or replacement. Webb dependability is a tradition backed by over 30 years experience.

One-half trolley illustrated

Note the high carbon steel drop-forged swaged type bracket, retainer type ball bearings, double labyrinth grease seals, flangeless steel wheels with hardened and ground races.

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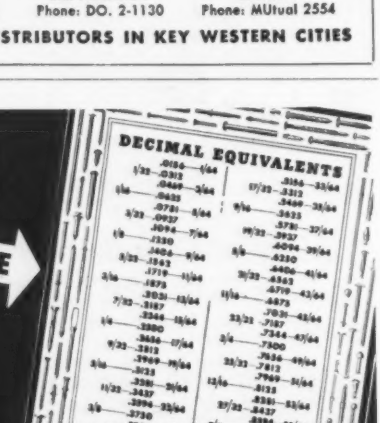
WRITE FOR FREE Hassall decimal-equivalent wall chart



In such popular demand (we've given away 50,000) — we've made it better. The new chart is far easier to read! In three colors to automatically signal decimal-equivalents of fractions. The special products which frame the chart are a constant reminder of a good source for cold-headed parts.

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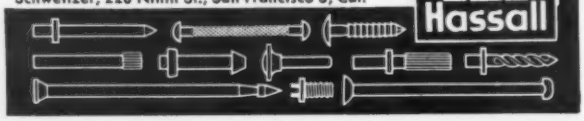


"physicals" of the metal. They are now being manufactured under a license agreement by *United Aircraft Products.*

445

Portable core grinder for production or jobbing

This portable foundry core grinder, manufactured by *Milwaukee Foundry Equipment Division of SPO Inc.*, is designed to handle a large range of core sizes and produces uniformly flat faces without broken edges. It is sturdily constructed for continuous as well as intermittent use and is mounted on large size casters so that it can be spotted quickly wherever needed. This model 18 grinder employs an 18-in. diameter grinding wheel mounted on an adjustable head which locks firmly in any position. Maximum clearance between table and face of grinding wheel is 18 in.; and maximum working capacity is 15 x 24 in. core surface. To speed production small cores can be mounted in multiples in gang fixtures. Machine can handle cores of one size in production quantity, or it can be adapted quickly for short runs on cores of various sizes. In operation, sand core is set in simple jig or fixture which is attached to table of machine. Table is swung into position, and wheel grinds core face perfectly, smooth and flat. Operation is completed in a fraction of time required for manual filing or scraping of cores and eliminates possibility of broken edges.

446

Alarm signals explosive vapor built-up

Currently available, this explosion-proof weather proof combustible gas alarm can be installed directly in suspected atmosphere. By convection and diffusion, surrounding atmosphere is subjected to a continuous watch against build-up of any kind of explosive vapor. Presence of such vapor is signalled by a bright red indicator light as well as by remote alarm units of various types which can be connected to terminals provided. While standard alarm point is established at 0.2 of lower explosive limit, other values can be provided where required. Either self-reset or lock-in arrangements can be provided to give a choice between an on-off indication of gas, or one which must be manually reset. Sensing unit can be located remotely from rest of alarm, if desired. Completely AC operated, this model is designed for rough service locations. It contains no meters or meter-type sensitive relays, but utilizes an electronic trigger-tube circuit to convert sensing unit signals into alarm indications. Electronic chassis is arranged

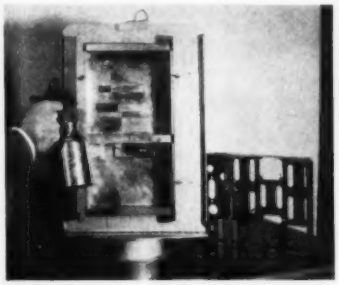
Use coupon, page 77, for more information

for quick and easy removal so it can be replaced with a spare chassis and conveniently shop serviced. Single-knob control cabinet combines a turn-to-balance and press-to-test function. Stand-by power consumption from 115-volt line is 15 watts. *Johnson-Williams, Ltd.*, is the manufacturer of this unit.

447

Non-corrosive stencils

For identification, with Matthews precision stencils a complete electronic chassis can be coded for its component parts by paint spraying in a few seconds. Each non-corrosive stencil guarantees accuracy of code marking and gives excellent service for the normal length of time any electronic model is in production. These stencils are made by specification to fit snugly over part to be marked. Each code symbol is precisely relieved from contour-formed stencil by expert craftsmen. Stencil holders make it possible to spray both sides of an electronic chassis in a single operation, and eliminate necessity of handling a "wet" stencil. An employee can easily spray codes or symbols on electronic components with perfect results and minimum fatigue. These stencils are not stock items since each stencil is engineered to fit a customer's specifications. *Jas. H. Matthews & Co.* produces these stencils.



448

Hermetically-sealed electrical indicating instrument

This ruggedized, hermetically sealed electrical indicating instrument is manufactured by *Phaostron Co.* under a license arrangement with *Marion Electrical Instrument Co.* It provides an accurate and sensitive means for electrical measurement under conditions of shock, vibration, tumbling and widely diverse weather conditions. It is completely interchangeable with all existent ruggedized types in AC and DC ranges. It is available in 1½, 2½, 3½ and 4½-in sizes. All component parts of these instruments are fabricated, assembled, adjusted, tested and hermetically sealed under controlled and exacting conditions, free from contamination.

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WHAT'S THE FASTEST WAY TO CLEAN METAL?
See page 11
WHAT'S THE MOST ECONOMICAL WAY?
See page 9

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449

Dumping unit for three-way use

A one-man hopper, this self-dumping unit, with its ½-cu. yd. capacity is designed for three-way use: pulling by hand, lifting and transporting by fork lift truck, and towing singly or in train by industrial tractor. It features a sturdy tongue for manual and tractor handling. Design also includes pockets for accommodating prongs of fork lift truck. These provide stability while the trailer is being carried by or dumped from a lift truck. Unit is made of heavy gauge steel of all-welded construction. It has wheels equipped with roller bearings and solid rubber tires. For maneuverability two of the wheels are castered. Balance of hopper is such that when the safety catch is released load is emptied, after which hopper automatically returns to loading position, re-engaging safety clutch. Available from *Phillips Mine & Mill Supply Co.*

450

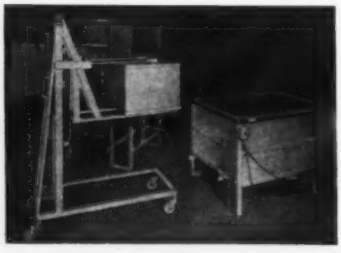
Sound-absorbing insulator

Insuplast is an economical, fire-resistant, granular insulating material that prevents echo and rumble by absorbing sound. It is a plastic mass made with exfoliated vermiculite and other mineral ingredients. Insuplast is a neutral tan color with a slight metallic lustre and is light in density. It can be troweled to a smooth, even texture or may be sprayed to produce a fine sand finish. Conductivity or "k" factor is .34. It is incombustible and may be painted, dusted, vacuumed or washed. It bonds directly to any clean dry surface. Manufacturer is *Building Materials, Inc.*

451

Cartridge for metal blanketing

For blanketing metals with hydrogen, nitrogen, carburizing or other atmospheres while they are being heat treated. *A. D. Alpine, Inc.,* employs a cartridge which contains parts to be treated and which is inserted into and removed from furnace by a mechanical loader trunk. Loader trunk picks up a completely loaded cartridge at any point in shop and deposits it in furnace.. Cartridge is then connected to a tank of the desired atmosphere and charged. Pressured, protective atmosphere is then maintained within the cartridge during heat treating cycle. Cartridge is carefully engineered so that charging and maintenance of protective atmospheres for an entire cartridge load of work costs only a few cents per heat. When heat treat cycle is completed, mechanical loader is again employed to remove entire cartridge load and to quench work, either in air or liquid in a quench tank.



Use coupon, page 77, for more information

452

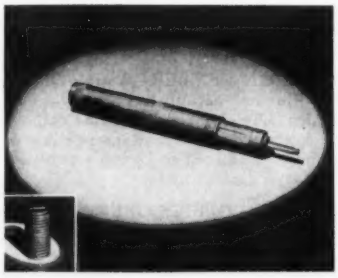
Moisture-proof sealing material

A putty-like material for sealing wide seams and gaps in metal, glass and non-porous surfaces has been designed by *Minnesota Mining and Manufacturing Co.*, for production line application. Sealer is a permanently soft, non-shrinking, moisture-proof and weather-resistant synthetic resin material for sealing out dust, drafts and moisture. It is a gray rubbery dough that is applied by putty knife or pressure or screw-type extruding equipment. Since it is not sticky to touch, it can also be rolled by hand into beads or globs and set in place. It has excellent resistance to water and weathering; does not dry out or become brittle upon aging; and is unaffected by continuous service in temperatures up to 200 deg. F.

453

Inserting tangs easily removed

Introduced now is a line of automatic tang break-off tools for removal of inserting tangs on helical-wire thread inserts, operates on principle of a spring-loaded center punch. Tools remove tangs quickly without disturbing inserts. Fourteen models permit tang-removal operations at production rates on the following sizes and lengths of stainless steel thread inserts: 6-32 to ½-13 sizes in national coarse thread series to lengths of 1, 1½ and 2 diameters; and 10-32 to ½-20 sizes in national fine thread series to same lengths. For other sizes and lengths of inserts, special punch assemblies (interchangeable with standard handles) can be supplied. *Heli-Coil Corp.*



454

All-around truck for shelf and bin materials handling

A light weight, aluminum alloy industrial truck, manufactured by *The Rol-Away Truck Co.*, is ideal for all around shelf and bin handling jobs. It has a handy patented ladder with non-skid steps. Its large curved handles serve as brace when operator climbs to higher shelves. Ladder legs slide down to make non-slip floor support. It is 36 in. high, 40 in. long and 20 in. wide. It weighs 50 lb., and has a 500-lb. capacity.

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- Openings in guard can be arranged for ejection of parts or insertion of material.
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4. LONG LIFE—Correctly lined up and properly lubricated, they last for years.

5. COMPLETE LINE—Pillow blocks with solid or split housings, and solid flanged blocks. Grease or oil lubricated and self-oiling types.

6. CAREFULLY PACKED—All are protected to reach you in factory-finish condition. Popular sizes are shipped in convenient cartons.

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THE WEST ON ITS WAY

ARIZONA

STRATO-JETS GET SET—U. S. Air Force signs agreement with Grand Central Aircraft Co., Tucson, for building facilities needed in modifying B-47 Strato-jet bombers. Contract includes extending main runway at Tucson Municipal Airport from 6,300 to 12,000 ft. It also provides for a new fuel testing center, electronics building and flight ramps. Del E. Webb Construction Co., Phoenix, and San Xavier Construction Co., Tucson, entered joint low bids for construction of runway.

KINGMAN'S HOSPITABLE HOUSING—With two Federal housing districts, a re-convertible hospital area and general city housing, United Boat Service Corp., Kingman, can easily take care of 750 workers and their families when peak production is reached in its light sheet-metal aircraft components dept., sometime next fall.

CAPITOL'S CAPITAL CAPTURED—National Malleable & Steel Castings Co., Cleveland, Ohio, buys all capital stock of Capitol Foundry Co., Phoenix, in an all cash transaction. Arizona Iron Works, Capitol's subsidiary, is included in purchase.

MATHIESON COMES WEST—Mathieson Chemical Corp. acquires Tovrea Land & Cattle Co.'s fertilizer division near Phoenix. New sections of Mathieson's agricultural chemical sales division, serving Far West from New Mexico to California, will result from the acquisition.

CALIFORNIA

VACU-BLAST IS UNMOVED—In spite of our efforts in this column last month to move Vacu-Blast Co., Inc.'s new Belmont factory out of the state of California into Arizona, we are honor bound to say that both the factory and the city of Belmont are still located within California's boundaries.

CALIFORNIA'S HERE TO STAY—Capital investment in new California manufacturing facilities hit an all-time record total of $539,316,000 during 1951. This figure is more than double the amount of similar investment during 1950 or any of the previous postwar years of rapid industrial expansion.

BECKMAN BOUND FOR LA HABRA—Electronic enterprises of Dr. Arnold O. Beckman, South Pasadena, which include Helipot Corp., Beckman Industruments, Inc., and Arnold O. Beckman, Inc., are slated to move to a 40-acre site at La Habra.

ZELLERBACH EXPANSION DEFERRED—Crown Zellerbach Corp., San Francisco, defers planned $19,700,000 expansion of its kraft pulp facilities. Building material shortages plus increase in U. S. and Canadian kraft production facilities influence Zellerbach's decision.

PICTURE IF YOU WILL—Pacific Neo Gravure Corp., subsidiary of Cuneo Press, Inc., Chicago, is spending about $2,000,000 on expanding its Second and Townsend St. plant in San Francisco. Program, including new rotogravure equipment, makes operation one of the largest of its kind West of Chicago.

SYNTHETIC PHENOL CINCHED—Standard Oil Co. of Calif. obtains government approval of its proposed synthetic phenol plant at Richmond. Certificate of necessity granted by Defense Production Administration covers 50% of process facilities and 45% of auxiliary facilities. Construction of plant will start shortly. It will be West's first synthetic phenol works. Phenol and acetone produced will go to Standard's subsidiary, Oronite Chemical Co.

NEW SULFURIC PLANT — Monsanto Chemical Co. plans on building a 250-ton sulfuric acid plant at Avon. Plant, to be owned jointly by Monsanto and Tide Water Associated Oil Co., and contracted to Leonard Construction Co., Chicago, should be in operation by end of 1952. It will use waste sludge and hydrogen sulfide piped from Tide Water's adjacent refinery. Greater part of acid produced will be used by Tide Water in processing aviation gasoline and petroleum products. Remainder will go to San Francisco Bay Area users.

ALUMINUM FLUORIDE FOR WEST—General Chemical Division, Allied Chemical & Dye Corp., will produce aluminum fluoride for Kaiser Aluminum and Chemical Corp., Oakland, under a long term contract. General Chemical now starts construction of a $2,500,000 aluminum fluoride plant located at General's Bay Point Works in San Francisco Bay Area. Initial production is scheduled for Jan., 1953.

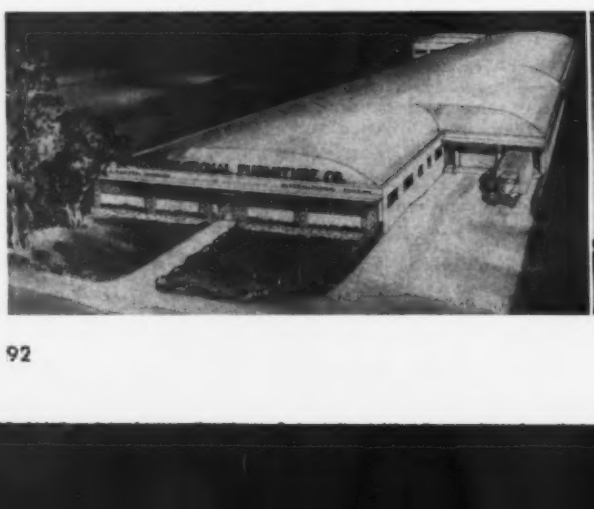
NEW UNION MEMBER—Union Oil Co. of California establishes By-Products Chemical Division which will be responsible for production and marketing of chemicals produced in Union's two new plants at Wilmington.

EXPEDITING OFFICE OPENED—Consolidated Vultee Aircraft Corp. opens new district office at Los Angeles with William A. Goodman in charge. This marks a step in expansion of Convair's new expediting system, unique in establishment of district offices manned by resident contract expediters in main U. S. industrial areas.

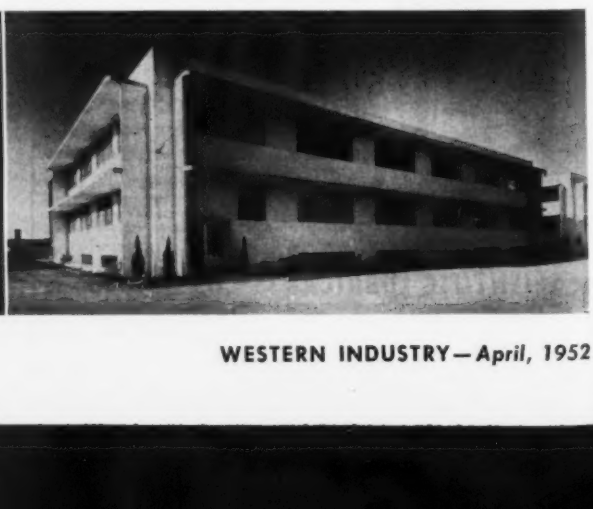
INGLEWOOD PLANT FOR METAL-CALS—Production of Metal-Cals is now under way in a new plant, opened in February, at 415 East Beach St., Inglewood. Headquarters for Metal-Cal manufacture remain in Seattle, Wash., where Metal-Cal was developed by Boeing Airplane Co. In order to be available to users outside of aircraft industry, product is manufactured under license by C & H Supply Co., Boeing Field, Seattle.

DIXIE CUP BRIMS OVER—Dixie Cup Co. leases from Daystrom Inc., an ultra-

INTERNATIONAL FABRICATES FURNITURE FACTORY—International Furniture Co. breaks ground on its 103,000-sq. ft. factory (artist's conception shown below) near Slauson and Western Avenues intersection, Los Angeles. Oscar C. Stahl and Assoc., Los Angeles, are builders and architects for $750,000 plant. It will serve the eleven Western states.



BUILDING FOR FLUOR—William J. Moran Co., Alhambra, completes construction on a new building pictured below for Fluor Corp., 2500 Atlantic Ave., Los Angeles. Structure, serving as engineering and drafting office, contains 9,500 sq. ft. floor area comprising two stories and a full basement. Many innovations are incorporated in $400,000 project.



modern 100,000-sq. ft. plant in Anaheim. Plant, to be in production this month, will serve West Coast and Mountain State customers. With machinery, equipment, facilities and rental, new building represents over $1,000,000 investment.

WESTWARD HO FOR WESTINGHOUSE — Westinghouse Electric Co. moves manufacture of log carriage drive motors to its Western headquarters plant in Sunnyvale. Previously all electric gearless drive motors were produced in company's Eastern plants.

P. G. & E. STEAMS UP—Pacific Gas & Electric Co. files application with California Public Utilities Commission for permission to build a steam electric generating plant near Pittsburg at a cost of $75,000,000, with an additional $8,000,000 to be spent for connecting lines.

PRODUCTION POOLS APPROVED—Production Pools approved by Defense Production Administration for handling defense contracts and subcontracts include Coordinated Manufacturers of Santa Clara County, Inc., San Jose, with 45 companies and 457 employees, and Central California War Industries, Inc., Fresno, with 22 companies and 815 personnel.

YOLO PLANS BLAST FURNACE—Yolo Steel & Metal Co. negotiates on a construction contract for proposed 1,000-ton blast furnace in Yolo County on Sacramento River. $44,000,000 tax amortization certificates are on hand from Defense Production Administration. Project is fully financed privately.

RUCKER RELOCATES—Rucker Manufacturing Co. moves into larger quarters at 4516 Hollis St., Oakland 8. Rucker Co., sales associate of Rucker Manufacturing Co., remains at 4228 Hollis St., Oakland.

SOX CITY—L. I. Gerges, Redlands, will shortly open that city's third hosiery knitting mill. Two of four knitting machines are now being assembled for operation.

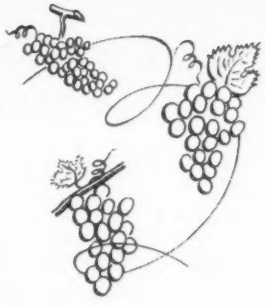
MONTEBELLO A.B.C.'S — Aluminum Body Corp., Vernon, plans to build a $150,000 aluminum truck and trailer body factory at Montebello. New plant, to be constructed in 1953, will include a 25,000-sq. ft. factory, 1,500-sq. ft. office building, and 1,500 sq. ft. of paint sheds. Present production will probably be doubled.

CONSOLIDATED LANDS AIRPORT—Consolidated Engineering Corp. purchases an airport adjoining Monrovia. Acquisition will provide expansion space for manufacture of instruments needed in electronics industry. Consolidated's two plants in Pasadena will continue to operate as usual.

DRAKE'S PROGRESS — Drake Steel Supply Co., Los Angeles, starts construction on an office building and adjoining warehouse at 2931 East Harbor Drive, San Diego. Office building area is 1,600 sq. ft. Warehouse has 14,000 sq. ft. of space.

SHIPYARD LEASE—Plant Bros. Drydock Co., San Francisco general and marine contracting firm, leases former General Engineering & Drydock Co.

FROM THE VINEYARDS TO HORTON TANKS



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New York 6.....3334—165 Broadway Building
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shipyard at Alameda from U. S. Navy. Operations of ship repair work and heavy industrial and steel fabrication are carried on under firm name of Independent Engineering & Drydock Co.

HUGHES IN NEWS—Public Relations Management Corp., New York, has been formed by incorporating public relations organizations in 16 U. S. cities. San Francisco office included in this merger is the firm formerly known as The Hughes Organization.

NOT STRICTLY INSTRUMENTAL — California Eastern Airways, Inc., purchases London Instrument Co., Chicago, Oakland Aircraft Instrument Service, Inc., Oakland, and 49.95% of stock in Land-Air, Inc., Chicago, all instrument and electronics companies.

NORTHROP NOTE — Northrop Aircraft, Inc., Hawthorne, grants exclusive manufacturing and distribution license of Northrop Seal Primer #75 to Sherwin-Williams Co., Cleveland, Ohio. Product is an improved type of zinc chromate primer for aluminum aircraft parts.

SILICA GEL DOUBLES—Silica gel output is doubled at Culligan-Zeolite Co.'s San Bernardino plant. Defense orders have made this rapid expansion necessary.

RE-ACTIVATED REFRIGERATION — Nine hundred retired refrigerator cars are to be completely reconstructed for the Western Pacific Railroad Co. Job, which involves steel frame superstructures, electric air circulating fans and other modern features will be done in shops of Pacific Fruit Express, Roseville. Cars will be ready for rails in early 1953.

FLIGHT FLASH—Compania Mexicana de Aviacion and Aeronaves de Mexico (affiliates of Pan American World Airways) have eleven 44-passenger transport planes on order from Consolidated Vultee Aircraft Corp., San Diego.

RICHFIELD ENRICHES—Richfield Oil Corp. acquires from Buttes Oilfield, Inc., two leases covering Buttes area west of Marysville in Sutter County. Richfield will make geophysical survey operations, and will start its first oil well in the area by April 12.

WINDY BUSINESS — Trade-Wind Motorfans, Inc., buys Pernot Corp.'s evaporative cooler department along with all machinery and equipment of that Norwalk firm. Trade-Wind also leases Pernot's 28,000 sq. ft. factory in Norwalk where evaporative coolers will be manufactured.

SHELL EXPANDS AGAIN—Shell Oil Co. starts work on new crude distillation facilities for its Martinez and Wilmington oil refineries. These programs plus those announced earlier for Shell's three Western refineries mean an expenditure of around $100,000,000. Program also means an additional 4,000,000 daily gallons for Shell's national output.

GOOD FOR GOODRICH—Major expansion plans for B. F. Goodrich Co.'s Los Angeles tire and tube manufacturing plant are slated to commence shortly. Plan includes new machinery and pro-

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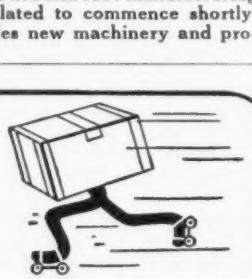

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duction facilities amounting to $2,000,000. Building construction calls for additional warehousing and production space of 175,000 sq. ft.

GOODYEAR GAINS GROUND—Goodyear Tire & Rubber Co., Inc., will occupy a $1,500,000 warehouse and office building which will be constructed near Vail Airport in Los Angeles' central manufacturing district. New structure, having 309,000 sq. ft. of space will cover 12 acres of a 15-acre tract. It will have a Santa Fe railroad on one side and truck facilities on the other.

U. S. RUBBER BUILDS LATEX PLANT—New plant substantially increasing facilities for production of rubber latex and plastic materials is completed in Los Angeles for Naugatuck Chemical Div. of U. S. Rubber Co., by H. K. Ferguson Co., industrial engineers and builders. Building, to serve as firm's Western sales headquarters, will also house technical service laboratories, facilities for compounding and storing natural and synthetic rubber latex and warehousing of resins, plasticizers, rubber chemicals and agricultural chemicals.

MORE CHEMICALS—First branch plant of Schwartz Chemical Co., Inc., opens at 41 San Jose Avenue, Burbank. New factory is equipped to manufacture chemicals for cementing, dyeing, cleaning and lacquering plastic products.

CORPORATE CONSOLIDATION—The 14 precision instrument and electronic equipment plants belonging to Beckman Instruments, Inc., Arnold O. Beckman, Inc., and Helipot Corp. in South Pasadena area will shortly be merged. New home is to be near Fullerton. Construction of new factory will commence this year.

COLORADO

SPARE SPRUCE PAPER PRODUCT—Heimbecher Sales & Service Co., Denver, plans manufacture of kraft paper pulp from beetle-killed spruce trees and waste wood from lumbering operations. Pulp wood supply will come from private and public forests in Colorado, Wyoming and Montana. Stockpiling of pulp wood will commence in June. First of five pulp mill units with 25 to 30 tons daily production should start up this summer. Building of first unit plus machinery will total $96,000.

NATURALLY GAS—Mountain Fuel Supply Co. discovers new source of natural gas supply at 4,900 ft. in its Unit No. 1 wildcat at Hiawatha Field, Moffatt County. If gas field proves extensive, more transmission facilities will be built to service northern Utah markets.

IDAHO

POTLATCH PLYWOOD PLANT—Potlatch Forests, Inc., Lewiston, will add to its veneer operations a cold press plywood plant. Unit, which will produce plywood from Douglas fir, pine and larch, will be in operation within four months.

TRUCK PACT REJECTED—Proposed reciprocal motor vehicle licensing between Montana and Idaho for trailers and trucks over 6,000 lbs. gross weight is rejected by Montana. Reciprocal privileges for trailers, semi-trailers, passenger cars, automobile dealers and trucks weighing in below 6,000 lbs. is agreed upon.

WESTVACO MINES MINERALS—Westvaco Chemical Division of Food Machinery & Chemical Corp. forms a Mineral Development Department with headquarters in Pocatello. Westvaco now mines barite, magnesite and dolomite properties in California and Nevada, is constructing a trona project in Wyoming, and uses phosphate shale from Fort Hall deposits.

MONTANA

PULP PAPER MILLS POSSIBLE—Three paper companies, Hammermill Paper Co., Erie, Pa., Rhinelander Paper Co., Rhinelander, Wis., and Lake State Paper Co. have made recent surveys of Missoula area. Of the three, only Rhinelander admits to looking for a new construction site.

OPERATIONS ALUMINUM—Anaconda Copper Mining Co. negotiates for partially refined bauxite with Reynolds Metals Co. in order to supply raw material to new Anaconda aluminum plant in the Flathead. Yearly bauxite purchases from Reynolds will be upwards of 100,-

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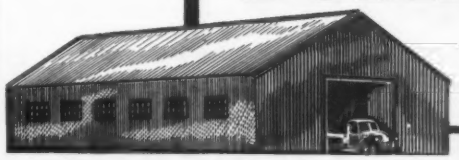

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000 tons, quantity needed for manufacture of 50,000 tons of aluminum. ACM's mining dept. continues search for a private bauxite source.

EATON ENLARGES — Eaton Metal Products Co.'s Billings plant expansion program calls for over $100,000 expenditure. Plans include installation of a 40-ton crane which will be largest in Pacific Northwest metal fabricating industry.

GASSING AROUND—U. S. Government okeys importation of Canadian natural gas by Montana Power Co. for Anaconda Copper Mining Co.'s use. Federal Power Commission has given authorization to bring in from Alberta gas fields up to 10,000,000,000 cu. ft. of gas which will be produced and transmitted up North by Canadian-Montana Gas Co., Ltd., and Canadian-Montana Pipe Line Co., subsidiaries of Montana.

DIAMOND MATCHES SUPERIOR — Diamond Match Co. will start construction of a $4,500,000 lumber mill, saw mill and match factory near Superior after July 1. These installations will give year-round employment to 250 men. Another 250 will be needed for nine months of the year in supplying timber.

NEVADA

OIL QUEST — Gulf Oil Co., Texas, schedules an extensive oil hunt in northern Elko County starting this spring. A $3,500,000 expenditure is planned for oil quest in Wells area and nearby districts. Exploration will go on for 3 years or until oil is discovered in commercial amounts.

FLY CRAFT — Nevada Air Products Co.'s goal is employment of 275 aircraft assemblers and riveters in its Reno factory. Company is engaged in production of aircraft parts for use by U. S. Navy.

KAISER'S FLUORSPAR FIRST—Kaiser Aluminum & Chemical Corp., Oakland, Calif., will build Nevada's first fluorspar mill on a 50-acre site just purchased near Fallon. New mill will process fluorspar from Kaiser's Baxter mine near Gabbs and will also be able to handle ore purchased from other sources. Construction of mill is to commence soon. Mill operations are scheduled to begin this fall.

NEW MEXICO

SULPHUR PLANT FOR FRUITLAND—Imperial Sulphur and Acid Co. commences construction of a $50,000 sulphur recovery plant at Fruitland. Production will start around July 1. When going full-speed-ahead, plant should produce 75 tons of sulphur daily.

TIMPTE CONTEMPLATES CONSTRUCTION — Timpte Bros., Denver, plans a new building at 4300 North Second St., Albuquerque, for manufacture of semi-trailers, vans, and special truck bodies. New layout will be triple the size of Timpte's present place, and produc-

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tion and employment will increase accordingly. O. G. Bradbury Construction Co. has contract for building plant.

BURRO MINE REVIVAL — Phelps Dodge Corp. intends to revive its Burro Mountain copper mine at Tyrone, about 60 miles north of Mexican border. Originally an underground operation, work at Burro may be reactivated by open pit methods.

OREGON

WILLAMETTE WINS CONTRACT — Willamette Iron & Steel Co., Portland, is awarded $1,577,000 contract for overhauling and altering U. S. Navy transport, Marine Adder. Sister transport, Marine Lynx, is undergoing a similar overhaul job in Portland.

MASSEY-HARRIS AMASSES SPACE— Massey-Harris Co., Racine, Wis., purchases a 3½-acre site at N.W. 82nd Ave. and Killingsworth in Portland. Plans are to build a 60,000-sq. ft. warehouse and sales office as Pacific Northwest distribution point for tractors, combines and other farm equipment.

HARDBOARD HARD AHEAD — Full scale production of hardboard is going on in Oregon Lumber Co.'s $2,500,000 plant at Dee. Between 120,000 and 180,000 sq. ft. per day in varied sizes, thicknesses and densities of a new product, Allwood Prestpanel are produced. Design and equipment of mill reduce labor, utilities and raw material requirements to among lowest in this rapidly expanding industry.

REICHHOLD RESIN REASON FOR OPTION—Reichhold Chemicals, Inc., New York, takes option on 26½ acres of Springfield city property as possible site for industrial expansion. Other sites in area are also under construction. Plans carry out Reichhold's policy of placing plants close to customers.

BABY IT'S COLD INSIDE — Terminal Ice & Cold Storage Co. starts construction of a 610,000-ft. capacity processing and cold storage plant in Woodburn. Unit should be completed about June 1 this year.

PORTLAND IS SWEETER — Amalgamated Sugar Co. opens Northwest's first industrial liquid sugar plant in Portland. Factory's capacity is 86,000 gallons

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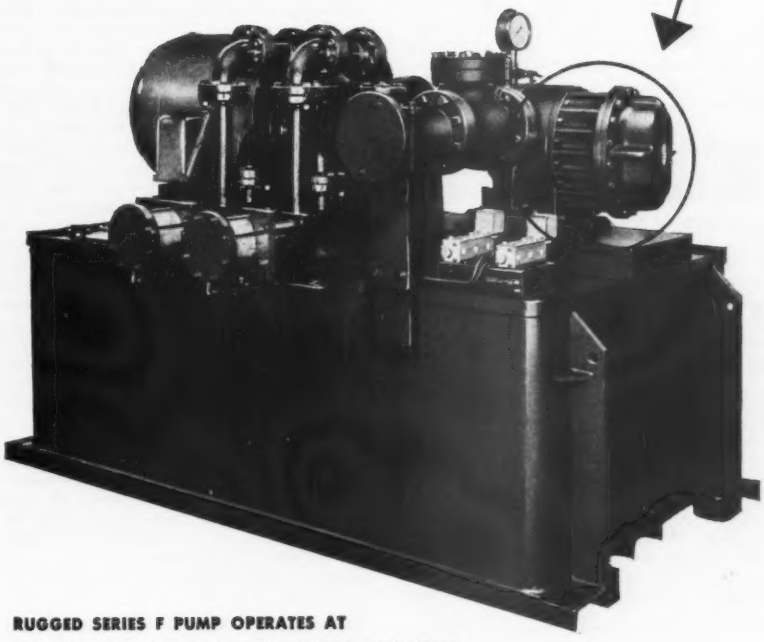

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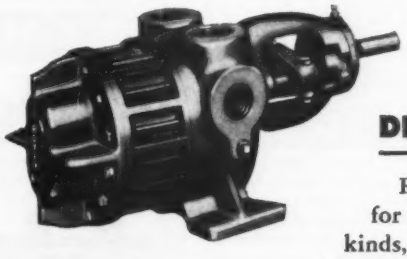

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PORTLAND PREPARES ALASKAN HOMES—Ten million dollars' worth of housing for Alaska is being planned by three Portland groups. Robert F. Johnson & Associates, Waale-Camplan and P. L. Crooks & Co., operating under the name of Anchor Homes, Inc., are set to begin a $4,000,000, 250 house on-site project at Anchorage, Alaska. Columbia Supply Co. plans 350 to 380 homes for Kodiak costing over $6,000,000. These latter units will be pre-fabricated with 90% of labor done in Portland factory.

UTAH

EATON'S BEATIN' ITS OWN RECORD—Eaton Metal Products Co. has plans for doubling capacity of its Salt Lake City plant in the next 18 months. Plant, now employing 75 people, will eventually provide for 150 workers. Firm will either cut size of its Denver plant or seek additional product outlets.

GARFIELD ADDS ACID UNIT—Garfield Chemical & Manufacturing Co., joint subsidiary of American Smelting & Refining Co. and Kennecott Copper Corp., plans early expansion of its Garfield sulphuric acid plant west of Salt Lake City. Unit, when completed sometime in 1953 will boost acidic output to 700 tons per day. Leonard Construction Co. holds construction contract for new addition.

CARTER CHARTERS OIL HUNT—Carter Oil Co., subsidiary of Standard Oil Co., New Jersey, allots $19,000,000 for an oil search during next two years. With other companies joining in project, this figure accounts for about one-half total planned expenditure. In all, program provides for drilling of some sixty wells in Uintah Basin area.

PIPE LINE COMETH—Salt Lake Pipe Line Co., subsidiary of Standard Oil Co. of Calif., plans a 330-mile oil products pipe line from Salt Lake City to Boise, Idaho. Completion of $8,000,000 line paralleling an existing two-year-old line to Boise will boost company's transportation capacity from 22,000 barrels to 39,500 barrels daily. If steel pipe is made available, work on project should get under way within a few months and could be finished by end of this year.

BRASS BUSINESS — This year Kennecott Copper Corp. will establish a multi-million dollar brass mill and fabricating plant somewhere in one of eleven Western states. Chase Brass and Copper Co., Kennecott subsidiary, will construct new plant. Firm is now surveying possible Western sites. Copper for fabricating facility will be supplied by Kennecott's electrolytic refinery at Garfield.

ALLEN STEEL'S EXPANSION—Allen Steel Co. starts $250,000 expansion program including construction of new plant facilities in Salt Lake City. In interests of national defense, National Production Authority approves program. Firm is engaged in production of structural and reinforcing steel, concrete reinforcing mesh and steel plates and sheets.

WASHINGTON

PROPOSED POWER IMPORT—Pacific Northwest Pipeline Corporation, Houston, Texas, abandons plan of supplying Pacific Northwest with Texas gas and files substitute proposal with Federal Power Commission to import Canadian gas for same purpose. A proposed 828-mile pipeline will bring about 250,000,000 cu. ft. of gas daily from Alberta, Canada, to serve principal Washington cities including Spokane, Seattle and Tacoma plus the Portland, Ore., area.

ALUMINUM PRODUCTION INCREASE—Kaiser Aluminum & Chemical Corp., Oakland, authorizes immediate construction of additional facilities for its Tacoma aluminum reduction plant. Plant's annual capacity will increase 33%, thereby upping its current 50,000,000-lb. yearly output to 66,400,000 lbs. per year.

TIMBER—To assure two Grays Harbor mills of a log supply, two timberland deals are made adding up to well over $1,000,000 and about 100,000,000 board ft. of timber in Grays Harbor and Jefferson counties. Bay City Lumber Co. takes over 59,000,000 board ft., and Blagen Mill Co., Hoquiam, acquires 24 parcels of land from Fridlander and R. J. Ultican, Sr. and Jr. Logging equipment, felled and bucked timber are included in transactions.

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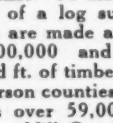

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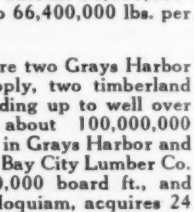

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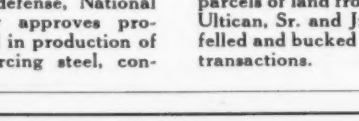

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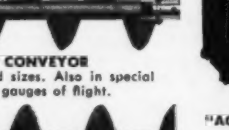
Made in all standard sizes. Also in special diameters and gauges of flight.

"ACE" ANTI-FRICTION COUNTERSHAFT BOX ENDS
Greatest improvement in Screw Conveyor Drives. Interchangeable with all old styles.

SECTIONAL FLIGHT
Self-supporting flights with uniform pitch and diameter in all sizes. Also ribbon, cut-flight, etc., with or without paddles.

FAMOUS NU-HY BUCKET
Delivers highest possible capacities of grain and granular materials.



BOLT-LESS CONVEYOR BOXES
With exclusive Hammond "U" edging and cover clamps.

END THRUSTS
Largest line of ball and roller bearing end thrusts with fabricated box ends.

Screw Conveyor Corporation
725 HOFFMAN ST. HAMMOND, IND.
ENGINEERS HAMMOND PRODUCTS MANUFACTURERS

Write for Cat. No. 749

NEW NEWSPRINT NEWS—Two West Coast newsprint companies win Defense Production Administration certificates of necessity for expansion. West Tacoma Paper Co., Tacoma, rates $4,474,000 investment to increase production by 40,000 tons per year. Publishers Paper Co., Oregon City, Ore., is to spend $247,000 for building facilities which will add 4,000 tons production yearly.

BOEING GROWING SUPER BOMBER—U. S. Defense Department awards contract to Boeing Airplane Co. for construction of a super bomber capable of containing an atomic engine. Boeing will work in close harmony with Pratt & Whitney Co., East Hartford, Conn., who will build atomic airplane's engine. Both plane and engine will be different type from that now under development by Consolidated-Vultee Corp. and General Electric Co.

ALCOA GROWS IN NORTHWEST—Aluminum Company of America plans expansion of fabricating facilities in Pacific Northwest. Immediate program, laying ground work for future expansion, calls for modernization and revision of ingot casting facilities at Alcoa's Vancouver works. Current expansion will cost $1,217,500, and it will create 50 job opportunities in Vancouver.

NEW NAME—Carnery-Rockwood Co., Longview, owned by Van Waters & Rogers, Inc., and Tennessee Products & Chemical Co., becomes Pacific Mineral Products, Inc. A $64,000 improvement program is planned.

FRUIT CO-OPS ADOPT NEW NAME—Result of $160,000 purchase of former Wenatchee Foods, Inc., by 43 fruit co-ops in Wenatchee-Okanogan district will probably be Northwest Fruits, Inc. Decision to operate cannery this season has yet to be made.

PURINA PLANS FEED MILL—Ralston Purina Co. will shortly start construction on a new feed mill at Spokane. This 39th Purina Chow plan factory will have over 100,000-ton annual capacity. It will employ local labor and use as much grain and other products as can be supplied locally.

SUGAR SITE SETTLED—Utah-Idaho Sugar Co. plans building a refinery for Columbia Basin sugar beets on 1,400 acres three miles from Moses Lake. Proposed $9,000,000 plant will have an annual 500,000-ton production capacity. It will employ approximately 250 men for five months of the year and 50 men all year round. In addition to sugar, plant will produce numerous by-products.

SEATTLE CHAIN GETS ROUND—Seattle Chain & Mfg. Co., owned by All Round Chain Companies, changes name to Round Seattle Chain Corp. Company is located at 6921 East Marginal Way, Seattle, with branches in Bellingham and in Portland, Ore.

WYOMING

NEW LEASE ON LAND—An unidentified oil company leases surface rights on 220 acres adjoining railroad between Manderson and Basin as a possible sulphur plant site. Sufficient territory is set aside to care for production needs of a large extraction installation.

OPERATIONS OIL — Sinclair Oil Co. plans on doubling its explorations for oil in Wyoming during next five years.

HUSKY OIL HITS DISCOVERY — Husky Oil Co., Cody, finds that its Torgeson wildcat in Big Horn County will make a 40,000,000 cu. ft. gas minimum on open flow. Torgeson well is a joint venture of Husky and Wilshire Oil Co., Los Angeles. They plan to start drilling a new well immediately on their 16,000 co-owned acres in same area.

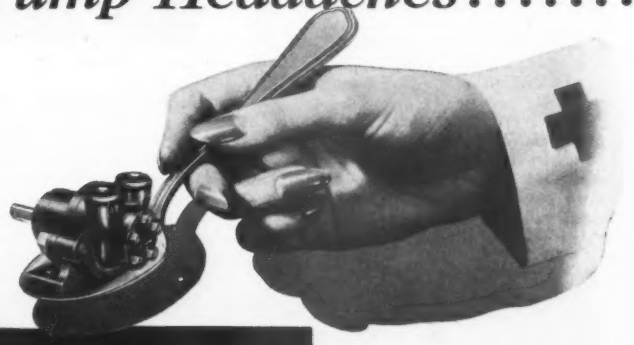
NEW FRONTIERS—Frontier Refining Co. starts a $500,000 expansion plan for its catalytic cracking unit at Cheyenne. New unit will have 6,500 barrels per stream day capacity compared to its present 3,100-barrel capacity. Program will probably be completed by January 1953.

TEST OPERATIONS AT LARAMIE PLANT—U. S. Bureau of Mines plans on a three-month full scale test operation in Laramie's alumina plant. A $1,000,000 grant is being requested for technical study at the Laramie operation beginning July 1. Plant tests process of alumina extraction from aluminous rocks.

BORDEN MILK SHAKES STATE—Borden Milk Co. completes Wyoming survey to determine feasibility of building a large condensation plant.

SURE CURE

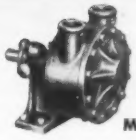
for Pump Headaches.....



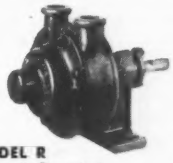
Specify TUTHILL PUMPS
for LUBRICATION
COOLANT
FUEL and LIQUID TRANSFER
HYDRAULIC MECHANISMS

MODEL C
(General Purpose)
For use with non-corrosive liquids. Low cost, low maintenance. Compact. Capacities to 200 g.p.m. and pressures to 100 p.s.i. Direct drive or belted units.

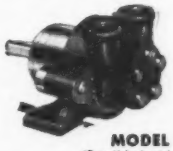
MODEL CK
(High Pressure)
Compact, ball-bearing pump in capacities up to 50 g.p.m. and pressures to 400 p.s.i. Direct drive or belted units.



MODEL M
(Coolant)
Has built-in automatic by-pass for protection against excessive pressure; also compensates for wear. Capacities to 50 g.p.m.



MODEL R
(Automatic Reversing)
Delivers from same port regardless of direction of shaft rotation without check valves. Capacities to 200 g.p.m.



MODEL L
(Small Industrial)
Mechanically sealed for leak-free service and low power consumption. Capacities to 3 g.p.m. and pressures to 600 p.s.i.

Write for Tuthill Pump Guide to help you select the exact pump for the purpose, whether it be for replacement or a new application on original equipment.

TUTHILL 25th Anniversary

TUTHILL
Pump Company
939 East 95th Street, Chicago 19, Illinois

WESTERNERS AT WORK

California

PROFESSOR MORROUGH P. O'BRIEN, chairman, Department of Engineering, *University of California*, Berkeley, is appointed a member of the Divisional Committee for Mathematical, Physical, and Engineering Sciences of *National Science Foundation*. Other Western appointees to this committee are DR. GEORGE W. BEADLE, director, The Kerckhoff Biological Laboratories, *California Institute of Technology*, Pasadena, and DR. DOUGLAS M. WHITAKER, Dean, College of Humanities and Sciences, *Stanford University* at Palo Alto, Calif.

California Public Utilities Commission appoints WALTER B. WESSELLS as assistant director of the Utilities Department, succeeding C. T. MOSS, retired. WILLIAM W. DUNLAP succeeds Wessells as telephone and telegraph engineer for the Commission.

Kelite Products, Inc., appoints LOUIS MCDONALD as director of development and control laboratories.

H. W. RICKER, manager of material at *Consolidated Vultee Aircraft Corp.*, is appointed assistant division manager of *Convair Guided Missile Division*, succeeding GAGE IRVING, who resigns to become general manager of *Hayward Industries, Inc.*, Glendale.

Sheusner

Mjolsnes

Enterprise Engine & Machinery Co. appoints JOHN H. SHEUSNER as manager of engineering and manufacturing. LEONARD O. MJOLSNES succeeds Sheusner as chief engineer.

RANDY WHITE, formerly chief estimator of *Arrowhead Rubber Co.*, becomes production engineer for that company's duct division at Long Beach.

Slick Airways, Inc., names CHARLES F. DWORSHAK as assistant to vice president in charge of operations. WILLIAM K. FOWLER takes over as assistant to vice president in charge of sales.

CHARLES A. ANDERSON joins *San Francisco Chamber of Commerce* as assistant manager of Industrial Department, succeeding JOHN E. SLATKY, who resigns to join *The Stanley Works*. Anderson is a former sales representative for *Gough Industries, Inc.*

DONALD E. RICE, former assistant general superintendent of *U. S. Steel's* Pittsburg plant, is named ganeral superintendent of that company's Torrance plant, succeeding OTTO A. KRESSE, retired. Rice is replaced by C. C. MORGAN, former superintendent of sheet finishing at Pittsburg. J. P. NEWMAN assumes Morgan's duties as assistant superintendent, sheet finishing; G. A. JEDENOFF, general foreman, cold reduction, moves up to assistant superintendent, sheet finishing. New general foreman is F. P. SMITH. E. N. ARCHIBALD takes over as general supervisor of inspection and testing.

Hagn

Robinson

Chiksan Co., Brea, appoints H. J. HAGN as president, succeeding W. EDGAR SPEAR. Hagn was formerly general manager of *Well Equipment Manufacturing Co.*, a Chiksan division. J. H. ROBINSON is elected vice president of Chiksan and general manager of Well Equipment Manufacturing Co.

National Production Authority appoints HARRY D. BROWN, former production manager of *Gates Rubber Co.*, as deputy director of rubber division.

RAYMOND D. SHELTON, superintendent of *Santa Fe Railway's* Valley division, is appointed assistant general manager, Coast Lines jurisdiction, with headquarters at Los Angeles.

Pacific Intermountain Express, Oakland, promotes HOWARD E. HARRIS, Oakland resident, to district service foreman.

New production manager for *Pacific Airmotive Corp.*, Burbank, is L. B. LITTRELL. He succeeds LUTHER HARRIS, who joins *Aircraft Engine and Parts Corp.*, New York, as executive vice president. Littrell was manager of PAC's engine division prior to this advance.

J. B. COOPER is named to represent engineering department of *AiResearch Manufacturing Co. of Ariz.*, Phoenix, at AiResearch's Los Angeles plant. RUSSELL D. CLARKE of the Los Angeles plant, is appointed to represent company's systems and procedures department at Phoenix.

C. WALTER WIKANDER is named vice president of *El Dorado Oil Works*, San Francisco.

HANS HELMLE becomes regional service manager of Los Angeles headquarters of *Fruehauf Trailer Co.* CHARLES WILLIAMS, office manager for Fruehauf at Phoenix for the past five years, takes over as regional comptroller at Los Angeles.

Newly elected officers at *Golden State Co., Ltd.*, San Francisco, are: Vice president and product procurement manager, R. A. BEATY; vice president and treasurer, J. BERT EASLEY; vice president and general production manager, JOHN C. LYMAN; vice president and Northern California manager, S. A. MITCHELL; vice president and personnel manager, A. W. REID; vice president and Southern California manager, E. D. STURTEVANT.

General Petroleum Corp. names MAX EPPS, former chief automotive engineer, as fuels consultant in company's marketing department. F. P. BAEYERTZ succeeds Epps.

C. G. CORTELYOU is appointed chief design engineer in this firm's engineering department, succeeding A. K. BRUMBAUGH, who joins refinery engineering department of *Socony Vacuum Oil Co., Inc.*, GP's Western affiliate.

COLONEL BRADLEY J. SAUNDERS, JR., USAF, is appointed as Deputy of Operations for *Western Air Procurement District*. In this assignment he will assist in all phases of district-wide Air Force plant and regional office operations on procurement, production, quality control and industrial development activities. Saunders is succeeded as Air Force Plant Representative at *Lockheed Aircraft Corp.* by LT. COLONEL CHARLES E. MOORE, USAF.

First promotions to new positions of supervisor—research at *Shell Development Co.*, Emeryville, include: G. W. BOND, F. R. BROOKS, S. GROENNINGS, F. H. STROSS, and F. T. WEISS. Appointments to positions of supervisor—development include H. A. CHENEY, D. D. DAVIDSON, F. D. MOSS and J. C. RAPEAN.

Fuehrer

Gillerstrom

H. A. GILLERSTROM becomes chief engineer of *Independent Pneumatic Tool Co.'s* newly created product engineering department, and GEORGE F. FUEHRER is appointed chief engineer of new development work. These two new divisions are at the company's Los Angeles plant.

WALTER T. NORRIS, formerly vice president *Pacific Iron & Steel*, Los Angeles, becomes vice president of *Union Steel Co.* New vice president in charge of production for this firm is PETE DALEBOUT.

HENRY DREYFUSS, industrial designer, names JULIAN G. EVERETT, ROBERT H. HOSE and WILLIAM F. H. PURCELL as partners in this firm. DORIS MARKS and RITA HART become associates.

Newly appointed officers of *Baash-Ross Tool Co.* are as follows: executive vice president, FRANK L. TOOLEY; secretary-treasurer, T. A. BOYD; vice president in charge of mid-continent operations, H. WOTKYNS; vice

president in charge of research and development, GLENN JOHNSON; general sales manager, E. M. GEARKE; chief engineer, JOHN L. DICKMANN.

O'Brien

AiResearch Manufacturing Co., division of *Garrett Corp.* names J. J. O'BRIEN as assistant manager. NORMAN MCCAULEY takes over as chief accountant. Promotions at AiResearch include FRANK SCHOEPE, cost analyst; LORIN ANDREWS, office manager; RICHARD GUNTER, chief cost accountant; OLIVER BRAUNING, supervisor of tabulating operations.

Western Gear Works names BILL CASWELL as general foreman for its Lynwood plant.

E. W. VAN BUSKIRK is elected president of *Coast Plywood Manufacturing Company and Sawmills, Inc.* New comptroller is JOEL N. BAUM.

Hiller Helicopters appoints JAMES B. EDWARDS to newly-created position of chief engineer. Edwards is former chief project engineer for *Douglas Aircraft Co.*

E. A. SEIPP, JR., heads up *Golden State Co., Ltd.'s* newly created new products division. Seipp is presently serving as manager of a subsidiary company, *Golden State Sales Corp.* CARL L. NELSON becomes advertising manager for Golden State Co., Ltd.

CORT MAJORS, general sales manager of *Fibreboard Products, Inc.*, is elected a vice president of that firm. C. L. MOREY is manager of company's timber division headquartered at 1789 Montgomery St., San Francisco.

Freeman

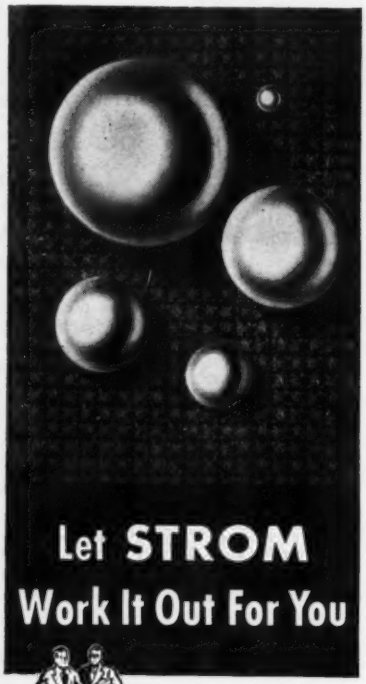
Fitzwilson

Craddock

Byrne

ROBERT B. FREEMAN, chief metallurgical engineer, is promoted to assistant to the vice president — operations, *Columbia-Geneva Steel Division, U. S. Steel Co.* He is suc-

a metal ball PROBLEM?



Let STROM Work It Out For You

Whether it is a precision ball bearing or one of the other many ball applications in industry, your problem will not be entirely new. Strom has been in on many ball problems and knows the importance of the right ball for the job.

Strom has been making precision metal balls for over 25 years for all industry and can be a big help to you in selecting the right ball for any of your requirements. In size and spherical accuracy, perfection of surface, uniformity, and dependable physical quality, there's not a better ball made.

Strom
STEEL BALL CO.
1850 So. 54th Ave., Cicero 50, Ill.
Largest Independent and Exclusive Metal Ball Manufacturer

Cut materials handling costs with
MAGCOA
Magnesium
DOCKBOARDS

Magcoa Magnesium Dockboards are proving the perfect answer to freight car and truck loading problems in every type of industry. One man can position it without the aid of truck, chain or hoist because it weighs ¼ as much as steel ramps of equal size and strength. Hand holds in each corner of the special quarter round safety curb permits ease of handling.

Beveled edges and bend angle keeps Dockboard flush with floor and dock. Slipping out of position is impossible due to safety span designed to application requirements. Put completely modern Magcoa Dockboards to work for you . . . they'll take the load out of your carloading operations.

Representatives in All Principal Cities

DIVISION OFFICES
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6922 W. 25th St., Los Angeles

MAGNESIUM COMPANY of AMERICA

ceeded by CHARLES H. FITZWILSON. JAMES L. CRADDOCK becomes district supervisor of Pacific Coast and Rocky Mountain audit district, succeeding JOHN T. S. BYRNE, who is transferred to Pittsburgh, Pa., as district supervisor of that steel producing district.

Joseph T. McNarney

Consolidated Vultee Aircraft Corp., San Diego, elects GENERAL JOSEPH T. MCNARNEY, (Ret.) as president, succeeding LAMOTTE T. COHU.

New general manager of *Van de Kamp's Holland Dutch Bakers, Inc.*, is EDWARD MILLS.

EARL D. PRUDDEN, vice president of *Ryan Aeronautical Co.*, is elected chairman of *California Aeronautics Commission*, succeeding NORMAN LARSON, *Pacific Aircraft Sales*, Burbank.

J. K. HORTON, *Coast Counties Gas and Electric Co.* board chairman, is named president of *Pacific Public Service Co.*, succeeding ERNEST G. LAWSON, retired.

G. J. TICOULAT, who has been serving the *National Production Authority* and *Defense Production Administration* in Washington, D. C., for the past fourteen months, returns to duty with *Crown Zellerbach Corp.* as vice president.

Colorado

A. Q. LUNDQUIST is appointed assistant general superintendent of Colorado operations for *U. S. Vanadium Co.*, a division of *Union Carbide and Carbon Corp.* J. F. BRENTON, plant superintendent at Rifle, is promoted to superintendent of plants, Colorado area.

Idaho

L. J. RANDALL, Wallace, is appointed president of *Hecla Mining Co.*, and R. W. NEYMAN, Wallace, is new general manager.

WALTER H. BRUMMETT, JR., contract coordinator of Idaho Operations Office, *U. S. Atomic Energy Commission*, becomes director of contracts and supply division, with direction of administrative operations branch which formerly was included in finance division. This branch includes procurement, supply, office services, telephone and teletype, mail and records, property management and reproduction services.

Nevada

GEORGE A. MCHUGH is named superintendent of *J. R. Simplot* mining operations at Palisades.

Oregon

Simpson Logging Co. appoints C. L. EMERY as general sales manager. A. L. DREGER is sales manager of fir and hemlock lumber.

PIERRE MICHEL PASQUIER is named assistant to president at *M & M Wood Working Co.* FRANK G. BREUER is new tax manager for that firm.

V. C. Gault

V. C. GAULT, currently industrial and community relations supervisor at *Crown Zellerbach Corp.'s* Camas, Wash., division, is appointed general safety supervisor for that firm at Portland, succeeding OTTO R. HARTWIG.

Utah

L. C. JONES is appointed chief engineer, *Utah Copper Division, Kennecott Copper Corp.*, succeeding GEORGE C. EARL, retired.

LOUIS BUCHMAN, general manager of Western mining divisions of *Kennecott Copper Co.*, is promoted to vice president and director. L. F. PETT, general superintendent of mines, is advanced to general superintendent of operations. J. C. LANDENBERGER, JR., director of labor relations, succeeds Pett.

32 East River Street, DAVENPORT, IOWA

Notes on Quality LIGHTING:
Here in the West the installation assuring maximum lighting efficiency with minimum service and maintenance is, by every standard of comparison, SMOOT-HOLMAN. The hallmark of quality in better buildings is the presence of SMOOT-HOLMAN equipment.
The New D-P Seal-Lux, pictured above, is a vapor-light fluorescent luminaire built for high efficiency and rugged service life under the most exacting conditions.
1 Collegiate Slimline fluorescent
2 D-P Line-Light
3 Constellation Slimline fluorescent
4 Educator incandescent
5 RLM Standard Dome Reflector
6 The Master floodlight
7 LH Ceiling light
ILLUMINATION EQUIPMENT
SMOOT-HOLMAN
INGLEWOOD, CALIFORNIA

SMOOT-HOLMAN COMPANY Inglewood, Calif. Offices in Principal Western Cities • Branch and Warehouse in San Francisco

V. S. BARLOW, assistant mine superintendent, takes over as mine superintendent. JOSEPH A. NORDEN, JR., assistant general drilling and blasting foreman, assumes duties as director of labor relations, replacing Landenberger. JAMES K. RICHARDSON, industrial engineer of Western mining division, is appointed assistant to general manager in charge of public, industrial and labor relations, succeeding ROY HATCH, retired.

Garfield Chemical & Manufacturing Co., jointly owned by *American Smelting* and *Kennecott Copper Corp.*, names E. McL. TITTMANN as president. He was formerly Utah department manager.

Washington

S. REXFORD BLACK, vice president in charge of Western division of *Georgia-Pacific Plywood Co.*, Olympia, is elected senior vice president. New vice president in charge of plywood and door sales is STEWART W. WHITE.

T. E. GAMLEN, chief project engineer for B-47 Stratojet production and R. M. ROBBINS, senior project engineer, *Boeing Airplane Co.*, Seattle, head up a group transferred to that firm's Wichita, Kan., division as part of a general reorganization of engineering project staff, under which a major share of B-47 production engineering responsibility is shifted to Wichita.

New director of industrial relations and personnel activities at *Simpson Logging Co.* is STEPHEN J. HALL.

Aluminum Co. of America appoints GEORGE R. STOUT as works manager of Vancouver reduction works.

ASSOCIATIONS ELECT

San Francisco Bay Area Council, Inc.: President, FREDERIC B. WHITMAN, president, *Western Pacific Railroad Co.;* vice president at large, WILLIAM E. WASTE, executive vice president, *Bechtel Corp.;* vice chairman, WILLIAM H. PARK, Oakland district manager, *Pacific Gas and Electric Co.*

McJimsey

Whitman

The Central Valley Empire Association: Chairman of manufacturers council, R. L. MCJIMSEY, division manager, *Drake Steel Co.*, Fresno.

Independent Refiners Association of California: Vice president, B. E. DEVERE, *Pathfinder Petroleum Co.*

Columbia Empire Industries, Inc.: President, PAUL L. FOWLER, *Fowler Manufacturing Co.*, Portland; first vice president, ALEX HAY, *The Long-Bell Lumber Co.*, Longview, Wash.; second vice president, CHARLES H. CARTER, JR., *Portland Woolen Mills, Inc.*, Portland; secretary-treasurer, GEORGE T. BRAGG, *Pacific Power & Light Co.*, Portland.

Mayer

Pacific American Steamship Association: President, ROBERT E. MAYER; vice presidents, HUBERT BROWN, assistant to president, *Pacific Far East Lines*, and H. B. PERRIN, vice president, *Matson Navigation Co.*; vice president — Seattle Puget Sound area, A. R. LINTNER, president, *American Mail Line*; vice president—Portland, HILLMAN LUEDDEMANN, vice president, *Pope & Talbot, Inc.*; vice president—Los Angeles-Long Beach, RALPH J. CHANDLER, vice president, *Matson Navigation Co.*

National Association of Manufacturers: International Relations Committee: CHARLES L. WHEELER, executive vice president, *Pope & Talbot, Ltd.*, San Francisco; J. D. ZELLERBACH, president, *Crown Zellerbach Corp.*, San Francisco; H. S. BAKER, president, *Producers Cotton Oil Co.*, Fresno; PHIL GREINETZ, *Los Wigwam Weavers*, Denver; and HOLBROOK MAHN, president, *Band-It Co.*, Denver. *Patents Committee:* EDGAR B. JESSUP, president and general manager, *Marchant Calculating Machine Co.*, Oakland; MARCELLUS S. MERRILL, general manager, *Merrill Engineering Laboratories*, Denver; and CARL A. NORGREN, president, *C. A. Norgren Co.*, Denver. *Distribution Committee:* FRANK H. ABBOTT, JR., president, *Sunset-McKee Co.*, Oakland; GEORGE D. HART,

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EDWARDS WIRE ROPE

E. H. EDWARDS COMPANY

General Office: SAN FRANCISCO, CALIFORNIA

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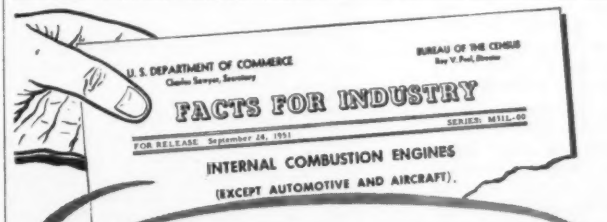
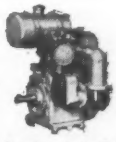


WISCONSIN *Air-Cooled* ENGINES Again Take First Place

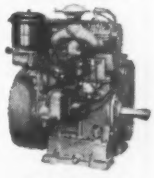
According to U. S. Census figures covering ALL carburetor type internal combustion engines, a total of 566,777 engines of 11 to 175 cu. inches displacement were produced and shipped by 41 different manufacturers to other companies during 1950. (This does not include automotive and aircraft engines or so-called "captive" engines built and incorporated into the equipment of the same company.)

Of the total of 566,777, Wisconsin Motor Corporation figures show that 206,737 were produced by this company, or 36.4% of the total in the specified H.P. range.

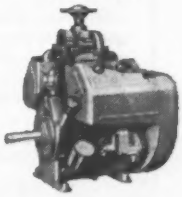
These figures are significant because they again offer outstanding proof of preference for Wisconsin Air-Cooled Engines by power equipment builders, distributors, dealers and users of power-operated machines and engines.



4-cycle single Cyl. models, 3 to 9 hp.



2-cylinder models 7 to 13 hp.



V-type 4-cylinder models 15 to 30 hp.

WISCONSIN MOTOR CORPORATION

World's Largest Builders of Heavy-Duty Air-Cooled Engines

MILWAUKEE 46, WISCONSIN

A-7061-1/2AA

The Lufkin Line

By VIC FAWCETT

"A LUFKIN— or a ROLLS-ROYCE?"

Vic Fawcett

The recent Auto Show held at the Pan-Pacific Auditorium in Los Angeles drew thousands. Here, for everyone to peek at and drool over, was an array of 1952 beauties representing the ultimate in design and engineering, presented by both the foreign and domestic automotive industry.

Like a lot of others, I was attracted by the foreign makes such as the Jaguar, the Minx, the MG, Rolls-Royce, and so on, all of which had a thorough going over.

At $10,750 per copy, the Rolls-Royce was in class all by itself. I happened to be ogling this masterpiece of automotive machinery when one of the crowd asked the R-R attendant why the car cost so much. The courteous and patient salesman (obviously "veddy" British), described in finest English diction, point by point, the elements of precision and quality which are built into each and every Rolls-Royce automobile.

"Built to last a lifetime," "Guaranteed unconditionally for 3½ years," "nothing to do but buy gas and oil," were just a few of the sales points, concerning this precision product, the epitome of automotive perfection!

Now ***Lufkin*** is a long way from Lymington-on-the-Thames, or wherever the English make their Rolls-Royce, and price-wise we're miles apart, but I couldn't help but feel there was a parallel here someplace. The same fine machining practices are employed in the ***Lufkin*** plant day in and day out, around the clock. Honing, grinding, balancing, testing and checking of meshing gears to provide smooth and silent service are but a few of the standard operations performed in the manufacture of ***Lufkin's*** truly fine products.

Maintenance of high standards in machining practice is probably the greatest single contributing factor to trouble-free performance and long operating life. ***Lufkin Gear Reducers*** and ***Speed Increasers*** have a life expectancy of 20 years—with normal care and maintenance, such as keeping the oil clean.

With no gas to buy, ***Lufkin*** is obviously a much better deal than a Rolls-Royce!

Vic Fawcett

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299 - 9th St., San Francisco, Calif.

Dallas Lufkin, Texas New York

president, *Farnsworth & Ruggles Draying & Warehousing, Inc.*, San Francisco; WALTER K. HINES, general manager, *Sun-Maid Raisin Growers of California*, Fresno; JACK HOW, general manager, *Edward R. Bacon Co.*, San Francisco; F. G. COLDREN, vice president, *Hallack & Howard Lumber Co.*, Denver; RICHARD S. BENNETT, president, *Bennett's*, Salt Lake City; and CHARLES D. SMITH, president, *Smith-Faus Drug Co.*, Salt Lake City.

B. P. Manley

Western States Fuel Policy Council: President, B. P. MANLEY, executive secretary, *Utah Coal Operators Association.*

Concrete Masonry Manufacturers Association: President, E. P. RIPLEY, *General Concrete Products*, Van Nuys, Calif.; vice president, JACK ALLEN, *Hollostone Co., Inc.*, North Hollywood, Calif.; secretary-treasurer, LEO HOWARD, *Rio Hondo Dunstone Co.*, Montebello, Calif.

Utah Mining Association: President, W. G. ROUILLARD, Garfield plant manager for *American Smelting and Refining Co.*

Electrical Maintenance Engineers Association of Southern California: President, GEORGE LARSEN, *Larsen Hogue Electric Co.*; first vice president, RICHARD ROGERS, *Ace Day & Night Electric Co.*; second vice president, HENRY R. BENTE, *Henry R. Bente & Associates*; secretary-treasurer, JOHN T. BENSON, JR., *Benson Bros.*

West Coast Electronic Manufacturers' Association, San Francisco Council: Chairman, NOEL E. PORTER, *Hewlett-Packard Co.*, Palo Alto; vice chairman, NORMAN H. MOORE, *Litton Industries*, San Carlos; secretary, JAMES J. HALLORAN, *Electro Engineering Works*, Oakland.

Western Frozen Food Processors Association: President, KENNETH R. HARTMAN, *Hartman Ranch Co.*, San Jose; vice president, H. D. BUXTON, *California Frozen Foods, Inc.*, Modesto; treasurer, J. L. HUDDLESON, *Honor Brand Frosted Foods*, Oakland.

California Manufacturers Association: Executive vice president, LUTHER A. NICHOLS.

Western Pine Association: Vice president, BRUCE ELMORE, McNary, Ariz. Other officers re-elected.

Canners League of California: President, DON B. WOOD, president of *Wood Canning Co.*, Stockton. Other officers re-elected.

American Institute of Industrial Engineers: Western regional vice-president, DONALD G. MALCOLM, assistant professor of mechanical engineering, *University of California*, Berkeley.

National Wooden Box Association, Pacific Division: President, CAL SETZER, *Setzer Forest Products, Inc.*, Sacramento.

Wooden Box Institute: President, J. H. DOBBIN.

The Redwood Region Conservation Council: President, E. T. F. WOHLENBERG, *Masonite Corp.*, Ukiah.

National Concrete Masonry Association: President, A. G. STREBLOW, president, *Basalt Rock Co.*, Napa, Calif.

California Forest Protective Association: President, R. D. ROSEBERRY, *Diamond Match Co.*

New Mexico Mining Association: President, JOHN A. WOOD, *Chapman and Wood*, Albuquerque; first vice president, W. PAGE MORRIS, general superintendent, *Duval Sulphur & Potash Co.*, Carlsbad; second vice president, IRA L. WRIGHT, general manager, *Black Hawk Consolidated Mining Co.*, Silver City.

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Western TRADE WINDS

News about those who distribute and sell industrial equipment and materials

DONALD E. DIXON is named service representative for *Hagan Corp.'s* automatic combustion controls and water treatment in Denver district. Colorado, Wyoming, Idaho, Utah, western Nebraska and northern New Mexico are included in district. Dixon has served for past two years as chief engineer in municipal power plant at Trinidad, Colo.

Dixon

Swift

Harry G. Swift & Co., 555 Sutter St., San Francisco, becomes sales and distribution point in San Francisco Bay area for *Rocket Pictures, Inc.*, of Hollywood, Calif. HARRY SWIFT, president of new firm, comes from *Marchant Calculating Machine Co.*, where he has been agency manager and international representative for past 12 years. Vice president is RICHARD C. WAGNER, also of Marchant.

THOMAS E. DAVIDSON, sales manager, *Union Steel Co.*, East Los Angeles, rises to position of vice president in charge of Union's aircraft and missile division.

Materials Handling Equipment Co., Inc., Portland, Ore., is now located at 2186 N.W. Wilson St.

GURDON F. WICKHAM and WILLIS H. BROONS are appointed to sales service department of *Synthetic Rubber Products Co.*, Los Angeles.

Drake Steel Supply Co., in re-aligning administrative personnel duties, makes following appointments: G. F. RADZAT, vice president—in charge of sales; F. BURNEBY, vice president—merchandise; H. S. WEISS, manager of field sales; KEN ABBOTT, manager of inside sales; QUENTIN KENNEY, buyer for wire and steel products; and KEN SAUNDERSON, buyer tubular products.

Polytechnic Research and Development Co., Inc., Brooklyn, New York, opens a Western sales office at 737 North Seward St., Hollywood 38, Calif. Office is under direction of W. A. C. A. YEARSLEY, Western sales engineer.

J. C. WASHINGTON is new sales manager of *Inet, Inc.*, Los Angeles. He succeeds BERT SCHIRESON, who left Inet to enter another field.

Montague-Harris & Co. opens its new building at 893 Folsom St., San Francisco. Firm invites friends and customers to visit its new home and plans a machine show shortly at which time dedication ceremonies will be held.

Eutectic Welding Alloys Corp., Flushing, N. Y., creates new regional sales office at Los Angeles. ROBERT B. WELCH becomes manager of West Coast office for Eutectic.

Van D. Clothier, Inc., Los Angeles, adds DOUGLAS A. MCMURCHY to its sales force. McMurchy's headquarters are at 1025 E. 16th St., Los Angeles.

RAY HOGABOOM is new district manager of Los Angeles branch, *Enterprise Engine and Machinery Co.*, San Francisco. Serving industry from San Francisco office are DENNIS J. O'LEARY and STUART F. ATSATT, both newly appointed sales engineers.

Pictured at open house in celebration of official opening of *Edward D. Maltby Co.'s* new sales office and warehouse for industrial division are from left to right: EDWARD D. MALTBY, president; FRED WARREN, general sales manager, and R. W. WILLES, supervisor of power transmission division sales. New quarters are located at 4035 E. 52nd St., Maywood, Calif.

WILLIAM F. NASH is new assistant traffic manager for *Union Pacific Railroad* at Los Angeles. Nash, who assumed his duties March 1, joined Union Pacific in 1910. Since 1938 he held post of general agent, freight department in Los Angeles.

Hickman Engineering Co., 420 Market St., San Francisco, is now Northern California representative for power specialties produced by *Hoppes Manufacturing Co.*, Springfield, Ohio.

W. T. INGRAM is named general sales manager of *Reynolds Metals Co.'s* Pacific Coast region. Ingram succeeds W. K. ALLEN FERGUSON who goes to Reynolds' general sales office in Louisville as general director, pricing, general sales organization. HAYDEN CLE-

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MENT, sales manager of packaging markets for Pacific Coast region, transfers from San Francisco to Los Angeles office.

Portland, Ore., branch of *Goodall Rubber Co.*, formerly located at 1303 N.W. Kearney St., moves to new quarters at 1111 N.W. 16th Ave., Portland 9.

Globe Container Co. makes *COSECO* (Coast Service & Converting), Los Angeles, its Southern California representative. COSECO serves West Coast as mill agent and custom converter.

Gits Bros. Manufacturing Co. names EDWARD S. PARSONS as a representative for its Shaft Seal Division. Parsons headquarters at 600 16th St., Oakland, Calif.

Parsons

Gleason

PATRICK J. GLEASON becomes general sales manager of *Tap & Drill E-Z Corp.*, El Segundo, Calif., manufacturers of a new tap and drill lubricant.

Stauffer Chemical Co., San Francisco, forms *Stauffer Panamerican Co.*, a wholly owned subsidiary for handling all Western hemisphere export sales. Offices are being established in several principal cities throughout Central and South American countries and in Canada.

Benjamin Borchardt and Associates, Los Angeles, is first management consultant firm on Pacific Coast to become member of *Methods-Time-Measurement Association for Standards and Research*. The other members are: *Bigelow, Kent, Willard and Co.; Serge A. Birne Consulting Management Engineers; George H. Elliott and Co.; Ernst and Ernst; A. T. Kearney and Co.; McClure, Hadden and Ortman, Inc.; Methods Engineering Council; Bruce Payne and Associates; John L. Schwab and Associates;* and *Stevenson and Kellogg, Ltd.*

Ceco Steel Products Corp., Chicago, appoints W. F. NORTON manager for Los Angeles district. GEORGE L. CAMPEN becomes manager of a new sales office in Denver.

Pacific Coast Chemicals Co., San Francisco, is now exclusive Northern California agent for *Morehouse Industries*, Los Angeles. FRANK G. COLLINS takes charge of speedline sales and service for Pacific Coast Chemicals Co.

ROLAND WOLF is recently appointed assistant sales manager, industrial division, of *Sherman Paper Products Corp. of Calif.* Wolf headquarters at Sherman Paper Products Corp.'s Los Angeles office.

Standard Wire & Cable Co., Culver City, Calif., is appointed West Coast sales representative for *Division Lead Co.*, Chicago, maker of solder and lead-tin products and soldering chemicals. Standard Wire is located at 9608 Venice Blvd.

Alloy Steel Products Co., Inc., Linden, N. J., appoints WILLIAM P. SIMMONS Western sales representative for states of California, Oregon, Washington, Utah, Nevada and Arizona. He will work closely with *Republic Supply Co. of Calif.*, authorized distributor of Alloy Steel's valves.

Emch

Sabin

Toledo Pipe Threading Machine Co., Toledo, Ohio, appoints JAMES L. EMCH new sales representative for north central state area including Colorado plus Cheyenne and Casper, Wyoming. Emch will headquarter in Kansas City. HAROLD W. SABIN takes on job of sales representative in Pacific Northwest. His area includes Washington, Oregon, Montana, Idaho and Wyoming with Vancouver and Victoria, B. C., Canada. Headquarters are in Seattle.

ACF-Brill Motors Co., Philadelphia, Pa., makes three appointments for firm's *Hall-Scott Motor Division*, Berkeley, Calif.: NORTON C. SATHER is new assistant division manager; DONALD M. BRISTOL, purchasing agent, and FRANK T. CORBIN, sales representative.

MELVIN L. GORDON is named northwest division manager for *Gould National Batteries, Inc.*, with headquarters in Portland.

CHARLES ELTON MCDONALD, formerly assistant superintendent, is new general manager for Western division of *Western Pacific Railroad*. He succeeds W. L. WHITE, deceased.

Kurt Orban Co., Inc., German machine tool importer, opens first West Coast branch office in 1105 Northern Life Tower, Seattle. FRANKLIN PRICE is general manager.

GEORGE DAVIS, Los Angeles electronic representative, is now Southern California and Arizona representative for *Pentron Corp.*, Chicago, manufacturer of recording tape and accessories.

ROBERT B. HICKS is newly appointed manager of *Pacific Airmotive Corp.'s* Commercial Aircraft Division, Burbank, Calif. G. F.

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SHAVER is appointed merchandise sales and manager, and P. L. ALLISON becomes assistant merchandise sales manager.

Essex Conveyor, Inc., Newark, N. J., now manufactures Cesco dumpers for eastern distribution while they are manufactured by *Colson Equipment & Supply Co.*, Los Angeles, for Western distribution.

CHARLES A. BLESCH, CLARK K. BENSON and ANDREW A. CARIDIS, all formerly of *Industrial Furnace Division of Natural Gas Equipment, Inc.*, have joined *Heat and Control, Inc.*, 285 Seventh St., San Francisco.

EUGENE A. BEDARD is appointed manager of *Detrex Corp.'s* San Francisco office. He succeeds G. T. EDWARDS, deceased. Bedard's San Francisco headquarters are at 90 Folsom St.

Aero Bolt & Screw Co., Inglewood, Calif., is appointed distributor for O-ring seals, manufactured by *The Parker Appliance Co.*, Cleveland, Ohio.

Pittsburgh-Des Moines Steel Co. opens a new Los Angeles sales office at 6300 Wilshire Blvd. R. C. Boss is in charge of new office.

Alert Supply Co., Los Angeles, now represents *Northwest Chemical Co.*, Detroit, Michigan.

PAUL W. O'DONNELL takes over as industrial relations manager for *E. D. Bullard Co.*, San Francisco manufacturer of safety equipment.

Cal-Pictures moves to new offices at 4063 Radford Avenue, North Hollywood, Calif.

Electronic Expansion On the West Coast

THE FIRST QUARTER of 1952 will show an amazing growth and development in manufacturing facilities for the electronic field on the West Coast, according to Leon B. Ungar, president of West Coast Electronic Manufacturers' Association, which is comprised of about 100 corporate members in the West.

A preliminary study has been undertaken previous to the summer publication of the WCEMA Directory of Members and Products with bulk figures released March 1 by Donald E. Larson, chairman of the association's directory committee.

Factory facilities now total 5,067,770 sq. ft., according to the survey; and there are 36,400 on the payrolls. Since some of the large airplane factories with electronic divisions are not listed therein, and since some of the small plants do not belong to the organization, it is estimated that the over-all pictures, viz., members and non-members, would be considerably larger than the directory figures.

Thirty-one per cent of the WCEMA member factories have railroad spur track facilities for shipment of finished product and rapid transportation for raw material.

GP's Vernon Refinery Wins Safety Citation

GENERAL PETROLEUM Corp.'s Vernon, Calif., refinery recently won congratulations from the National Safety Council for its record of five years without a lost-time accident.

In achieving this record the 265 employees at the Vernon plant worked a total of 2,781,210 man-hours during the five-year period. The group has not had a lost-time accident since January 6, 1947.

Relax—Next Time Try a 'Copter

ALTHOUGH a number of helicopter operating companies have been authorized to carry passengers for hire, the nation's first actual scheduled passenger service is expected to be launched within a short time at Los Angeles by Los Angeles Airways.

A pair of Sikorsky S-55, 12-seat helicopters are slated to be delivered to that firm this month. After "shakedown" runs, the ships will be put into scheduled service carrying eight persons and a mail cargo. Comparatively low fares will be in force—for example, with L. A. International Airport as the base, passage to Santa Ana will cost $3.96; to Pasadena, $3.42; to San Bernardino and Riverside $6.00, all quoted one-way.

Long range plans of the firm call for scheduled passenger transportation to all these cities in 20-passenger helicopters (on some routes). Heliports used, in some instances, will be on top of some of the downtown buildings.

Since 1947, this firm has been carrying mail around Southern California by helicopter. In July of last year, CAB authorized L. A. Airways to carry passengers between 45 cities it now serves as aerial mailman.

Operation "Soup Bowl" At Los Alamos

SLATED TO PLAY an important part in atomic research at University of California's Los Alamos Scientific Laboratory, is a small, relatively inexpensive chain reactor known as a "water boiler." This unit consists of a stainless steel sphere filled with an enriched radioactive solution known as "soup."

The sphere, which is 1 ft. in diameter, is surrounded by a graphite reflector and a large amount of concrete shielding. Inside are a cooling coil and a 1-in. pipe, called "glory hole," in which materials are irradiated. Because of its great resistance to corrosive action by the radioactive "soup," stainless steel was used for the water boiler as well as for an underground conduit which carries the "soup" from the reactor and for an exhaust pipe which carries off corrosive gases.

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you can do

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to produce more

Your selection of actual devices can be made later. It's how you put them together that counts . . . whether motors, controls, transformers, electric furnaces or induction heating. Many manufacturers make good electrical apparatus. Westinghouse, in fact, makes a broader line than anyone else. But the priceless ingredient Westinghouse offers you, in addition, is the skill of broadly experienced engineers in putting together the right combination of good apparatus to let you produce more with what you have. Westinghouse Electric Corporation, Pittsburgh, Pa.

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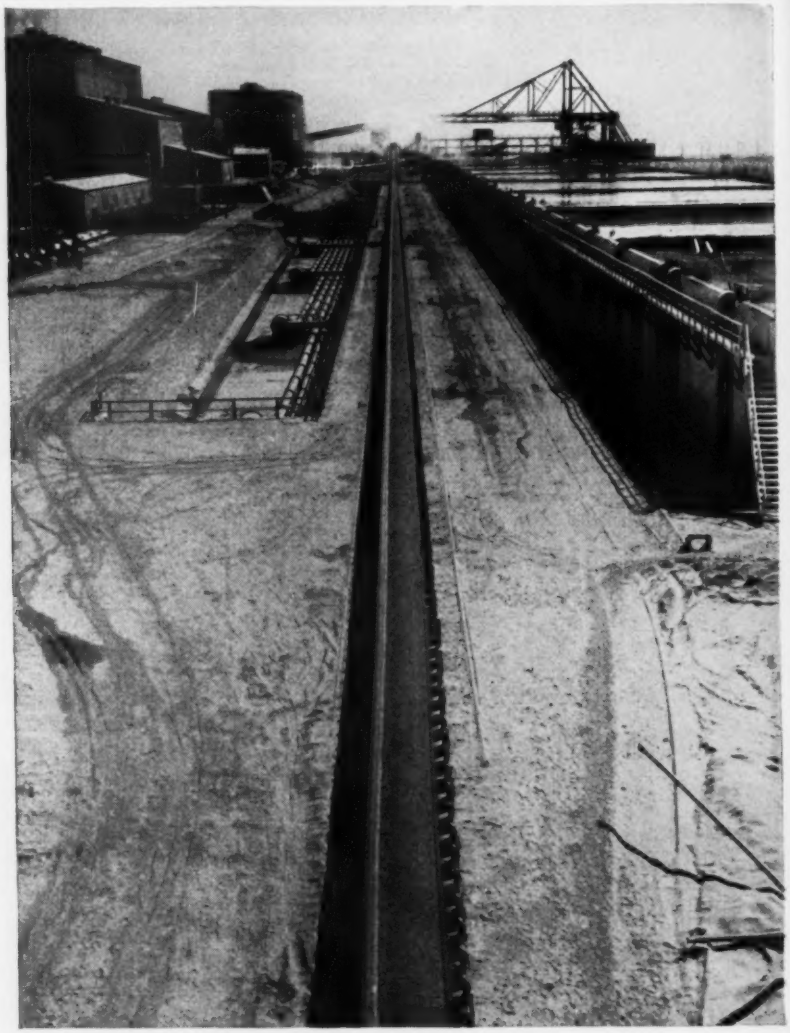

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Reduced and sized ore is moved by 60" wide S-A belt conveyor from crushing and screening house to travelling unloading bridge. The latter is a cross belt for depositing ore in a series of large vats parallel to the S-A belt conveyor. Material is reclaimed from the vats by an unloading bridge and grab bucket. The belt conveyor, illustrated, as well as other belt conveyors in the system, are equipped with S-A No. 444 live shaft carriers

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